IN DEFENSE OF HIGHER VALUES • RIDDLE OF THE CRYSTAL SKULLS • PRAYER STUDY FAILURE

Skeptical Inquirer

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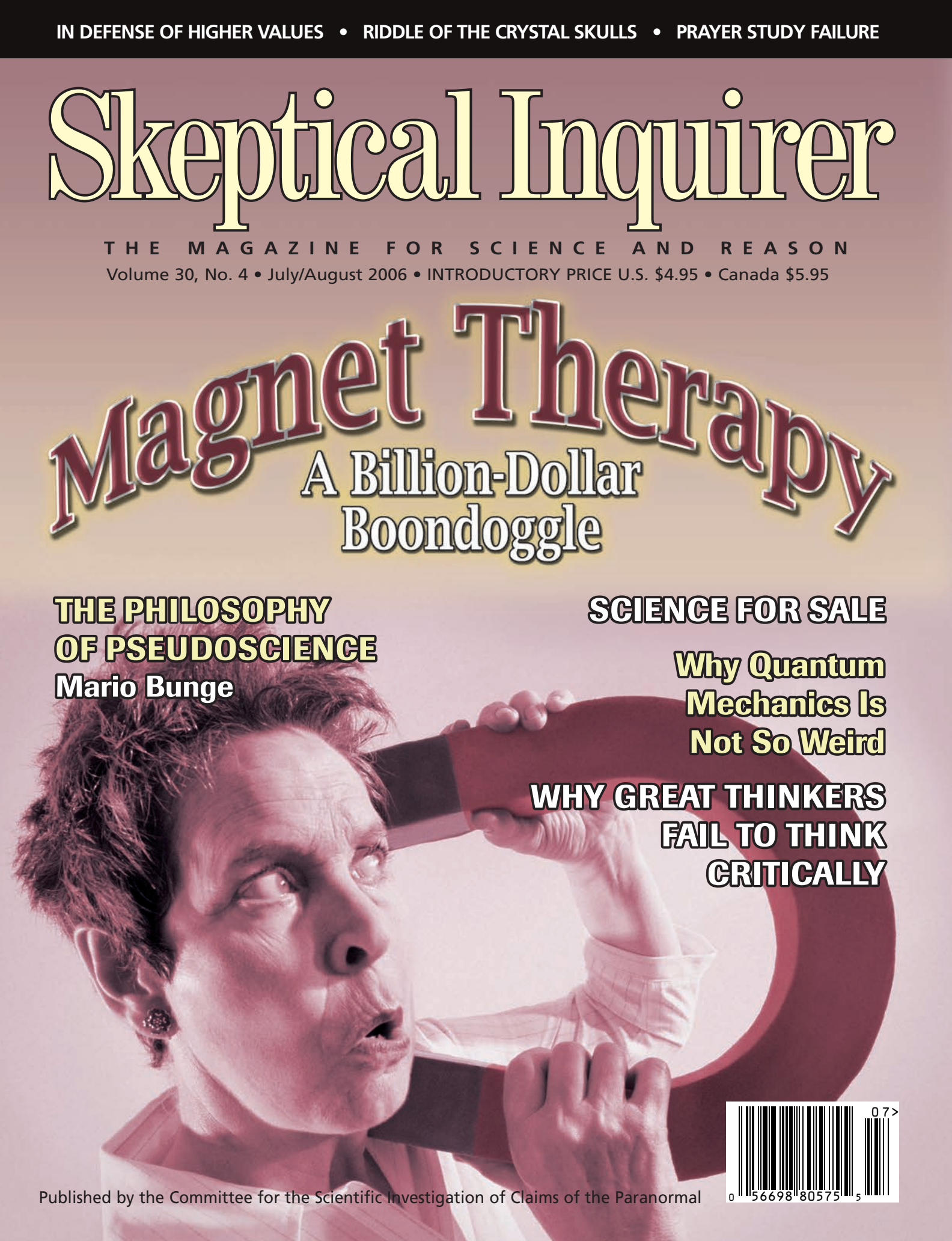
Magnet Therapy
A Billion-Dollar Boondoggle

THE PHILOSOPHY OF PSEUDOSCIENCE
Mario Bunge

SCIENCE FOR SALE

Why Quantum Mechanics Is Not So Weird

WHY GREAT THINKERS FAIL TO THINK CRITICALLY



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A Billion-dollar Boondoggle
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Editor's Note

Explanatory Frameworks and Investigative Exposés

For every issue of SI we try to provide a nourishing variety of material. First, there's the variety of types of material—articles, news, columns, commentaries, book reviews, letters, and so on. Then there is the variety of topics we examine and of approaches to those topics. We hope there is something for everyone in this mix, and I think there usually is.

Our feature articles tend to be evaluative, explanatory, or investigative. It interested me to see how the five articles eventually selected for this issue relate to these categories and to each other. First, their authors: a philosopher, two physicians, a physicist, and a psychologist. That's a fairly typical mix of fields represented in SI, which is irrepressibly interdisciplinary, or cross-disciplinary.

Philosopher Mario Bunge's article "The Philosophy Behind Pseudoscience" is, it seems to me, powerfully explanatory. We give it more space than usual because I think it provides a comprehensive, explanatory, intellectual, philosophical framework for virtually every issue we address in the SKEPTICAL INQUIRER. Professor Bunge notes that every intellectual endeavor, "whether authentic or bogus," has an underlying philosophy. Science has at least six philosophical underpinnings and four other distinguishing features. Pseudoscience has its own set. The philosophies of the two just happen to be perpendicular to each other. For example, the demanding ethics of science does not tolerate the self-deceptions and frauds that plague pseudoscience. Bunge argues that his "exercise in border patrolling" can help distinguish between good and bogus science and reveal why research guided by a wrong philosophy is likely to fail. Don't miss his takes on specific fields: self-organizing systems, unconscious mental processes, psychoanalysis, computationist psychology, quantum theory, string theory, and "pockets of pseudoscience ensconced in the sciences."

Physician Bruce Flamm's article on magnet therapy is resolutely investigative, as was his earlier exposé in SI of the now notorious Cha/Wirth/Lobo Columbia University "pray for fertility" study. Flamm summarizes a study he and Drexel University physicist Leonard Finegold published in the *British Medical Journal* showing that the field of magnet therapy is about as worthless as metal filings, "a billion-dollar boondoggle."

Physician/medical editor Ragnar Levi's "Science Is for Sale" is also investigative and evaluative, but here the topic is science itself, especially medical science. He finds the integrity of much medical research threatened by the economic interests of the drug industry, which influences "every institution that might stand in its way."

Psychologist D. Alan Bensley's "Why Great Thinkers Sometimes Fail to Think Critically" goes back to the explanatory. It probes the question of how two great thinkers, Arthur Conan Doyle and Alfred Russel Wallace, could be such good critical thinkers in some areas and such credulous believers in others. It turns out that having good skills in critical thinking, which they did, is not the same as exercising them in all areas, which they did not.

Finally, physicist Paul Quincey's "Why Quantum Mechanics Is Not So Weird After All" is, I think, an intriguing and valiant attempt to explain quantum theory within a framework where the bizarre oddities that it reveals are understandable from a classical physics viewpoint. It is, in effect, an experiment in explanation.

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One Big STEP: Another Major Study Confirms That Distant Prayers Do Not Heal the Sick

BRUCE L. FLAMM

For almost a decade, investigators at six academic medical centers including Harvard and the Mayo Clinic have been working on a major study of distant prayer. The results of their monumental effort, the largest study ever to search for effects of intercessory prayer, have now been published and the conclusion is crystal clear: prayer had no beneficial effects whatsoever (Benson et al. 2006).

The research, called the STEP trial (for "Study of the Therapeutic Effects of Intercessory Prayer") was meticulously designed to detect any effects of distant prayer. Note that prayer or loving words said at the bedside may reassure a patient and cause soothing physiologic mind/body interactions. In contrast, distant prayer is claimed to work via supernatural or paranormal mechanisms. This study was designed specifically to investigate distant prayer.

STEP investigators enrolled 1,802 cardiac bypass surgery patients from six hospitals and randomly assigned each to one of three groups: 604 patients received intercessory prayer after being informed they may or may not receive prayers (Group 1); 597 patients did not receive prayer after being informed they may or may not receive prayer (Group 2); and 601 patients received intercessory prayer after being informed they definitely would receive it (Group 3). The study enlisted members of three Christian groups, two Catholic and one Protestant, to provide prayer throughout the multiyear study.

To avoid bias and to ensure the results would be valid, none of the patients in the first two groups and none of their doctors knew which patients were being prayed for. This complex type of study, called a randomized double-blind controlled trial, is considered to be the gold standard for scientific proof.

What did they find? When the mountain of data was subjected to statistical analysis the researchers found no significant differences in any outcomes between groups 1 and 2. In other words, when patients did not know if they were being prayed for, distant prayer had absolutely no effect.

Interestingly, the patients who were told that they definitely would receive distant prayers (group 3) actually had worse outcomes than the other two groups. Was this the work of an angry god? Probably not. The study authors postulated that telling patients they definitely would receive prayer may have increased their anxiety levels by leading them to believe that they were so sick that they needed prayer. The high anxiety and stress thus generated may have caused more complications, such as irregular heartbeats.

Bob Barth of Silent Unity, the prayer organization in Lee's Summit, Missouri, that was the Protestant group involved in the study, said the results didn't shake his confidence in prayer. "People of faith don't need a prayer study to know that prayer works," he said. Dozens of newspaper articles about the study included similar comments.

Florida Psychic Jailed For Fraud

Linda Marks, 57, a self-proclaimed psychic who worked out of a Delray Beach, Florida, storefront called "The Psychic Shop," pled guilty to three counts of wire fraud May 10, 2006, and was sentenced to four years in federal prison, three years of probation, and payment of $2 million in restitution to her victims. Her accomplice Jack Makler, 64, a recently retired Delray Beach police detective, was sentenced to five years in prison with three years of supervised release and ordered to make restitution of $235,700.

Marks was arrested in April 2005 while on probation from an earlier offense involving insurance fraud. Her scam was to prey on elderly patrons of her shop, convincing them that their savings were cursed and she would remove the evil from the money and return the cash after the spell was broken. Once the cash was delivered to Marks the money would disappear, and she would often relocate to another area to start the scam again. One victim was an end-stage leukemia patient to whom she promised a cure, but instead stole his life savings of $320,000.

Makler's part in the scam was to provide protection for Marks. Assigned to investigate complaints against her in 1994, Makler instead fell in with Marks and her husband and became her assistant while still pretending to work the complaints. He persuaded victims to accept partial reimbursement to drop charges, interfered with investigations, blocked her supervision while under probation, and lied to both Delray Beach Internal Affairs and federal investigators about their activities.

Marks was eligible for a fifteen-year sentence, but prosecutor John Kastrenakes requested leniency for her because her cooperation helped convict Makler.

—Greg Martinez

Greg Martinez works and lives in Florida.

This raises an interesting question. Why waste several years and millions of dollars conducting a rigorous multicenter prayer study if you are not going to believe the results? Could it be that these were not the results that investigators were hoping for? Would they have questioned the results if prayer was found to be effective? The $2.5-million study was funded primarily by the John Templeton Foundation, an organization that pumps millions of dollars each year into efforts to promote religion and superstitious beliefs.

Father Dean Marek, a Catholic priest and co-principal investigator of Mayo's part of the STEP study opined, "I'm sure God will be very pleased with the results of this and getting people talking about the results of prayer in their lives." Since the study showed absolutely no beneficial effects of prayer one must wonder exactly what Father Marek has in mind. Perhaps he means that people should be talking about the fact that prayer is a waste of time.

More likely he is referring to the countless excuses that will be used to explain the complete failure of prayer in this major study. A few examples include: God knew it was a study so he did not answer the prayers; God does not like to be tested; God prefers prayers from family members; the prayers were answered but not the way we expected; and of course the classic, God works in mysterious ways. The truth is that once supernatural phenomena are claimed, the list of potential explanations for failure becomes infinite. In other words, for true believers the claimed healing effect of distant prayer is nonfalsifiable; nothing could ever change their minds.

But for people who make decisions based on evidence, intercessory pray has been dealt a fatal blow. The results of the STEP research confirm the results of the MANTRA II trial, another major study that was published last year (Krucoff et al. 2005). The MANTRA II study evaluated prayer in hundreds of cardiac patients at nine medical centers. Just like the STEP study, it concluded that distant prayer had absolutely no beneficial effect on any health outcomes.

Only one randomized controlled scientific study has ever demonstrated apparently profound effects of distant prayer (Cha, Wirth, and Lobo 2001). However, as described previously in the SKEPTICAL INQUIRER (September/October 2004 [www.csicop.org/si/2004-09/miracle-study.html] and March/April 2005 [www.csicop.org/si/2005-03/miracle-study.html]), the Cha/Wirth/Lobo "Columbia Miracle Study" turned out to be highly flawed and almost certainly fraudulent. Co-author Daniel Wirth was convicted of criminal fraud and is now incarcerated in federal prison: co-author Rogerio Lobo of Columbia University has removed his name from the bizarre research.

In simple terms, the STEP and MANTRA II studies both found intercessory prayer to be totally worthless. If prayer was a drug being tested for effectiveness, these well-designed studies would have destroyed it. A medication that failed this miserably in two huge randomized trials would never be approved by the FDA.

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Dr. Flamm has been the senior investigator on more than a dozen medical research studies and is the author of several medical books. He has a major interest in supporting science over superstition. His ongoing investigation of the bizarre Columbia University "pray-for-pregnancy" study was published in the SKEPTICAL INQUIRER and has been the subject of articles in Time, The New York Times, The Los Angeles Times, *and other newspapers and magazine all over the world.*

Governor Snubs Kentucky Academy of Science About Intelligent Design

Kentucky Governor Ernie Fletcher recently snubbed the Kentucky Academy of Science (KAS) in a discussion about whether intelligent design should be taught in the commonwealth's public schools.

In his January state of the commonwealth address, the governor endorsed the teaching of intelligent design as an alternative to evolution. Following this address, KAS sent the governor a letter expressing its objection "to attempts to equate 'scientific creationism' or 'intelligent design' with evolution as a scientific explanation of events," according to Jeanne Harris, executive director of KAS.

The governor responded with a letter stating that intelligent design is a "self-evident truth" and that not teaching intelligent design in science classes would "undermine the foundation of our nation." He further commented that it "disappoints and astounds me that the so-called intellectual elite are so concerned about accepting self-evident truths that nearly 90 percent of the population understands."

However, it appears that this letter was not even written as a direct response to KAS. Rather, it seems to be a form letter sent out by the governor's office in response to any letter expressing concern about the teaching of intelligent design.

Immediately after the governor's address in January, Brent Norris of Edmonson County, Kentucky, wrote the governor expressing similar concerns, posting both his letter and the governor's reply on his blog (www.brentnorris.net/blog/?p=191). The governor's reply to Norris was identical to the response he sent to KAS. According to Ken Carstens, KAS legislative committee chair, the academy was not initially aware that the governor's response was a generic letter, commenting that the incident was "very interesting."

Governor Ernie Fletcher. Photo by Scott J. Ferrell

The Kentucky Academy of Science was founded in 1914, and its membership encompasses 700 scientists and academics across the commonwealth. Since 1981, the academy has passed four resolutions opposing the teaching of creationism and supporting the teaching of evolution, with the most recent being a unanimous vote during its annual meeting in November 2005, according to a December press release.

While the governor supports the teaching of intelligent design, he noted in his letter that no new legislation was needed because Kentucky law (KRS 158.177) already allows the teaching of creationism in Kentucky schools. Furthermore, that law requires science teachers to give credit on exams for Bible-based accounts of human origins.

—David Ludden

David Ludden is an assistant professor of psychology at Lindsey Wilson College in Columbia, Kentucky.

Dinosaur Adventure Land Slated for Demolition

Flamboyant young-earth creationist Kent Hovind may see his lucrative creationist theme park Dinosaur Adventure Land in Pensacola, Florida, fall beneath a wrecking ball and bulldozer. When Hovind built the park in 2001 he refused to pay Escambia County the required $50 filing fee for a building permit. He has long argued that the fee was an illegal attempt by government to control his church. Hovind executed many delays in the case including switching attorneys, filing for a public defender, requesting changes in the judges hearing the case due to alleged bias, and failing to appear in court. (See "Stupid Dino Tricks," SKEPTICAL INQUIRER, November/December 2004.)

In March 2006, the case finally had a hearing before Circuit Judge Michael Allen, who ruled the owners of the park were in contempt of court. Within days Escambia County authorities locked up the museum, science center, fossil shop, and schoolhouse buildings, and levied a fine of $500 per day if the buildings are used or occupied. Eric Hovind, Kent's son, appeared before the Escambia County Commission during their April 6, 2006, meeting and appealed for an exemption from the county's permitting requirements as a religious organization. He was advised that the park must comply with the court's order and accede to the county's permitting requirements. The April 7, 2006, *Pensacola News Journal* quoted Commission Chairman Mike Whitehead advising Hovind that "Scripture also says 'Render unto Caesar what Caesar demands.' And right now, Caesar demands a building permit."

In late March 2006, Hovind posted a message on the Dinosaur Adventure Land Web site decrying the actions of the court. He asked visitors to the Web site for donations and to contact Escambia County Commissioners and other officials to demand they "stop this madness." He also suggests that, if their efforts fail, "DAL can move to a more God-fearing county." A final order on this case is still pending, awaiting a hearing of Hovind's appeal of the previous court decision.

—Greg Martinez

'Alien Rains' of Kerala Not So Alien after All

Since January 2006, news headlines the world over have advanced the claim that extraterrestrial microbes rained down on India. Even the cover of the *New Scientist* read "Alien Rain" (March 4, 2006). What is the basis for such an extraordinary claim? The reports claim that microscopic particles that colored monsoon rains in Kerala, India, between July and September 2001 have defied all efforts to identify them. But since 2003, two scientists, Godfrey Louis and Santhosh Kumar, believe they've solved the mystery: the particles are extraterrestrial (ET) cells released into the rains from a meteor explosion.

Could this be the first evidence of ET life? Not so fast! It turns out that the government of India had commissioned a study of the colored rain. Within two weeks of the first colored rain, *The Indian Express* reported (on August 6, 2001) that the Center for Earth Science Studies (CESS) and the Tropical Botanic Garden and Research Institute (TBGRI) had determined that the rains were colored by some kind of spore. Then in November of 2001, commissioned by the government of India, the CESS and TBGRI issued a report concluding that the spores coloring the rain had been grown in culture and were from an aerial algae of the *Trentepohlia* genus that grows

A Swedish Professorship in Parapsychology

When the Danish margarine manufacturer Poul Thorsen died in 1962, he had recently bequeathed a large sum of money for a professorship in parapsychology and hypnology. The universities of Stockholm and Copenhagen declined the offer. Lund University in southern Sweden accepted it. However, two persons were entitled to an allowance from the same fund. Therefore, the donation could not be used until the last of them had passed away, in 2001.

In May 2003 Lund University announced a professorship in "psychology, including parapsychology and hypnology." From the thirty applicants the University selected an American, Etzel Cardeña, who was appointed to the position in June 2005 and took office on September 1. The choice was controversial since none of the three members of the expert evaluation committee ranked Cardeña first. Cardeña is primarily known as a researcher in theoretical hypnology, and has published very little within the field of parapsychology. Cardeña is apparently the only professor in parapsychology in Europe.

A few days after his appointment, Cardeña was interviewed in *Aftonbladet*, a major Swedish daily. In the interview, he said that paranormal phenomena (including telepathy, precognition, and telekinesis) have been demonstrated in a large number of controlled studies.

Lund University

In reply, two Swedish skeptics (Sven Ove Hansson and Dan Larhammar) and two parapsychologists (Jan Dalkvist and Joakim Westerlund) wrote a joint article in which they pointed out that Cardeña's statements did not accurately reflect the state of knowledge in the field of his professorship. Cardeña replied, claiming that he had been misquoted, but without retracting the central claim that paranormal phenomena have been scientifically demonstrated.

Last September 1 Cardeña was briefly interviewed on a national evening news broadcast. Referring to attempts to influence random number generators by paranormal means he said that "there are a number of well-controlled experimental studies where people have replicated what seems to be something like this happening."

As yet, Cardeña has held this office only for a few months. It remains to be seen what directions his academic activities will take.

—Jesper Jerkert and Sven Ove Hansson

Jesper Jerkert and Sven Ove Hansson are, respectively, the chairperson and founding chairperson of Swedish Skeptics.

prolifically in Kerala. The findings were published in *Eos: Transactions of the American Geophysical Union* (83[31]:335, 2002). None of the alarming "alien rain" reports refuted the *Eos* study's findings; they simply didn't report those findings.

So what was being presented as an unsolved mystery was in fact a long-solved mystery. Yet even without the official findings, there were important aspects of this case that should have raised serious skepticism. For example, the purported means of transporting the alleged ET cells to the Earth was a meteor. But the only basis for a meteor burst was merely that some Keralan residents reported extremely loud thunder and flash of light just before the first colored rain. But a better explanation is common thunder, not an extremely rare audible meteor burst. Moreover, how could a meteor burst on July 25 account for colored rains falling sporadically from July to September? The monsoon winds passing over Kerala would have quickly swept away airborne microscopic meteor debris to locations far away. But by the ET theory, the particles that fell in the colored rains of late September would have been falling *straight down* continuously since the meteor burst in July, which, to be blunt, is simply inconceivable nonsense that by itself refutes the whole ET theory.

Other aspects of the ET story should have aroused skepticism. For example, Louis and Kumar claim that their tests of the particles found no DNA, and from that finding Louis argues: "The genetic molecule DNA is present in all living organisms found on Earth. So the absence of DNA indicates that they are extraterrestrial." But that inference from allegedly unique cells to ETs is a *non sequitur*, since there are no known traits of ET cells. The argument simply invents a category of things (ET cells) and a category-inclusion criterion (lacking DNA) without any prior empirical justification. By the same reasoning, any unique type of organism discovered on Earth could be categorized as an invasive ET. Of course, not only is the proffered inference to ETs fallacious, but the particles in question were found to be a *known* variety of algal spore.

Regarding the DNA question, Professor Milton Wainwright of Sheffield University told me that his tests of the particles sent to him by Louis and Kumar find that they *do* contain DNA. But another DNA-test procedure did not find DNA. However, even with such mixed DNA findings, given (1) the findings reporting in *Eos*, whose researchers grew the particles into a *Trentepohlia* algae, (2) that Louis and Kumar report that they heated the particles to 370° C, but spore DNA can be damaged above 100° C, and (3) the fallacious inference from oddities to ETs, there is simply no reason to doubt the terrestrial origin of the particles that colored the rains of Kerala, India.

—Ian Williams Goddard

Ian Williams Goddard is majoring in computer science at the University of Maryland University College and does archival research at the National Library of Medicine.

Alien Autopsy Hoax Revealed—Again

Many people have seen the grainy, black-and-white film showing the supposed postmortem examination of one of the extraterrestrials who allegedly crashed near Roswell, New Mexico, in 1947. Some believe it; many others believe that it's a fake. Recently, a model-making sculptor from the British film industry has publicly admitted to having created the aliens in the 1995 film.

John Humphreys, a graduate of the Royal Academy who has previously worked in theater and on such projects as *Doctor Who*, *Max Headroom*, and *Charlie and the Chocolate Factory*, has admitted to sculpting the latex alien corpses that went under the knife in the 91-minute film. According to *The Times* of London, the film was shot in an apartment in Camden in the north of London, far from its supposed setting in the southwestern United States. Philip Mantle, a long-time investigator of the hoax, told *The Times* that "Humphreys had been a prime suspect but had never admitted involvement."

The infamous alien autopsy film from 1995.

The aliens dissected in the original hoax film (and in a new movie that's based on it) are latex models molded from clay sculptures, with their body

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cavities packed with "sheep brains, chicken entrails, and knuckle joints" obtained from a nearby meat market, according to Humphreys. In an online interview with the BBC, he says that he didn't know what the producers of the film intended to do with the footage when they hired him; he just approached it as "an exciting thing to be involved in."

The new movie, *Alien Autopsy*, is a retelling of the making of the hoax autopsy film and was released in Britain in April 2006.

The 1995 film has always been looked at with a great deal of skepticism in at least some circles (see Joe Nickell's piece "Alien Autopsy Hoax" in the Nov./Dec. 1995 SI), but is nonetheless thought to be authentic by some enthusiasts. Interestingly, however, the hoaxed 1995 autopsy film is still said to be based on an older film that does show the real event: an autopsy performed on an extraterrestrial in the New Mexican desert in 1947. Ray Santilli, producer of the 1995 hoax, maintains that it was based on real footage that he obtained from a retired American military filmmaker. The original film, he says, was damaged when it was re-exposed to air after so many years, so recreating it was the best option.

So is the newly released comedy a fiction based on a hoax based on another hoax based on a rumor? Perhaps only future confessions will tell the whole story.

—David Park Musella

David Park Musella is an editorial assistant with the SKEPTICAL INQUIRER.

The Wrong *Stuff:* Men's Magazine's Psychic Columnist

While popular women's magazines have for decades featured regular astrology columns, magazines aimed at the men's market have also gotten into the paranormal act. Though astrology is frowned upon (studies show that fewer men than women believe in astrology), magazines include columns and articles on topics such as ghosts and psychics along with scantily clad women, sports features, and reviews of the latest "guy gear."

The magazine *Stuff*, for example, has a regular column called "Beyond the Grave: Interviews with Dead Celebrities." It's not clear how tongue-in-cheek the readers take it, but the psychic is certainly serious about it. She is "world-renowned medium Victoria Bullis" (her Web site also insists that she's "internationally known"; rarely do psychics tout themselves as "locally known").

Apparently some celebrity interviews are easier to arrange after the subjects have died, perhaps because their schedules quickly clear up. In the April 2006 issue Bullis supposedly contacted slain rap icon Tupac Shakur. The first question among about a dozen asked by the magazine (through Bullis) was how he is doing now that he's dead, and Shakur's fans will be relieved to know that "he's doing well."

Instead of providing any useful, interesting, or verifiable information from "the other side," Shakur's spirit—as spirits often do—stuck with vague information. Not that the interviewer didn't try: When

asked, "Do you know who killed you?" (Shakur's murder remains unsolved) Bullis—er, Shakur—demurred with, "Of course! When you pass to the next life you see the whole thing. That's a question I'm not going to answer. That could be dangerous." For as often as stories are told of restless spirits seeking revenge for their murders, you'd think they would take the opportunity when contacted by mediums to avenge their deaths by giving damning information or directing police to incriminating evidence. Shakur's spirit seems to prefer that his murder remain unavenged. Bullis also states that Shakur and Abraham Lincoln "hang out" together in the afterlife; apparently the Great Emancipator and the rapper/convicted rapist have much in common.

In the following month's installment, Bullis gave insight into comedian Chris Farley's afterworldly presence. Oddly enough, just about the only people that Bullis mentions whom Farley is now "hanging out with" are ex-*Saturday Night Live* cast members—not childhood friends, not other relatives—recognizable dead folks from his show such as Phil Hartman and John Belushi. And how is Farley doing these days? You guessed it: "He's happy."

—Benjamin Radford

Benjamin Radford is managing editor of the SKEPTICAL INQUIRER.

Center for Inquiry Opens in India

Dr. Vijayam Gora, director of the Gora Science in Vijayawada, and Dr. P. M. Bhargava, Vice Chairman of the Knowledge Commission of the Government of India.

The inaugural meeting of the Center for Inquiry-India brought together experts from the fields of science, philosophy, human rights, and international affairs.

Jawaharlal Nehru, the founder of modern India, famously called its mills and dams "temples of modern India." Article 51(a) of the Indian constitution enjoins its citizens to cultivate "scientific temper, humanism, and the spirit of inquiry." The government-supported Indian Institutes of Technology are standard setters around the world. And yet, paradoxically, the orthodox Hinduism enjoys great popularity among India's elite scientists, and gurus like Sai Baba command considerable respectability and public influence. Compare the United States, where elite natural scientists are among the most secular-minded people: the rate of belief in a personal deity among physicists and cosmologists in the National Academy of Sciences is less than 10 percent.

This paradoxical situation was one of the topics of a February 2006 gathering of outstanding scientists, academics, journalists, and activists in Hyderabad, on the occasion of the launch of the Center for Inquiry's new Indian branch. The chief guest was Dr. P.M. Bhargava, one of the country's most distinguished cellular biologists and Vice Chairman of the Knowledge Commission of the Government of India. Also present were the noted guru-buster Premanand; Amardeo Sarma of the Center for Inquiry in Germany; David Triggle, a professor emeritus of pharmacology at the State University of New York; and Austin Dacey, United Nations representative for the Center for Inquiry in New York City. The opening of CFI/India was mentioned in a February 23, 2006, feature story in *The Hindu*, India's largest English-language daily newspaper.

In the spring of 2006, CFI/India opened offices in the high-tech city of Hyderabad and established a research library on science, skepticism, philosophy, and humanism. The branch will be led by Dr. Innaiah Narisetti, a philosopher specializing in the work of the Indian humanist M.N. Roy, and Dr. Santishree Pandit, a professor of international relations at the University of Pune. One of CFI/India's first activities was to meet with the Vice Chancellor of Sri Potti Sriramulu Telugu University in Hyderabad to demand the discontinuation of the university's courses in astrology and Vaastu, an ancient spiritual system of architecture and environmental design similar to feng shui.

The Center has also begun to collaborate with Meera Nanda, the Indian-born science-studies scholar who has documented the connections between Hindu nationalism, postmodern anti-science, and so-called Vedic science in works such as *Prophets Facing Backwards: Postmodern Critiques of Science and Hindu Nationalism in India* (Rutgers University Press, 2003). In February 2006, Dr. Nanda appeared at a Center for Inquiry conference in Florida.

The Center for Inquiry/India is online at www.centerforinquiryindia.org.

—Austin Dacey

Austin Dacey is Executive Director of the Center for Inquiry/Metro New York and the Center's representative to the UN. □

In Defense of the Higher Values

KENDRICK FRAZIER

When Paul Kurtz brought us to the SUNY–Buffalo campus thirty years ago to found CSICOP, the nation was awash in what he called "The New Irrationalisms."

Velikovskyism saw ancient world history through a bizarre prism of civilization-affecting planetary pinballs.

Von Dänikenism attributed major achievements of ancient history, especially in the New World, not to the ingenuity of indigenous peoples but to ancient astronauts visiting Earth and stimulating creation of its archaeological wonders.

Gellerism promoted a showman conjuror as a real psychic with an ability to bend spoons with his mind and to cause several prominent but credulous physicists to lose their grips on reality.

Astrology had gained such a foothold on thought that astronomer Bart Bok and Paul Kurtz provoked worldwide controversy over a simple "Objections to Astrology" statement signed by 192 prominent scientists saying that astrology was bunk and had nothing to do with astronomy.

Paranormalism seemed everywhere, and New Age mystical thought that arose as part of the counterculture revolution of the late '60s influenced and entwined broad segments of society.

And reports of UFOs, despite the critical Condon report only seven years earlier, flew in regularly and gained credulous publicity in the press.

We have never limited ourselves to just the paranormal and pseudoscience. We deal with all topics at the intersection of science, public perception, and public misperception, with emphasis on those that attract large notice or that raise important public issues.

In the intervening three decades the specific claims that we might broadly label paranormal or pseudoscientific have changed dramatically. Most of the specific manifestations of the enthusiasms I just mentioned have waned. Some have even disappeared.

The situation has changed so much that Paul sometimes argues that no one is interested in the paranormal anymore. (I almost detect a certain longing!) We have some interesting internal debates about that, but to the degree it is true I have argued, and still do argue, that one key reason has been the remarkable work of CSICOP and the SKEPTICAL INQUIRER . . . and the network of scientists, scholars, and investigators worldwide it invigorated in forcefully addressing these and similar claims, providing detailed scientific analyses that showed their empirical poverty, and—in the end—debunking them. Solidly. Convincingly. Comprehensively. I think it has been a remarkable achievement.

Of course, as many of us note, although the cultural climate has shifted a lot, and in some respects for the better, the modern communications revolution has multiplied almost exponentially the number and types of outlets now available for the rapid promulgation of all new information and ideas, good and bad, reliable and unreliable—and that goes for pseudoscientific and paranormal nonsense and all its popular manifestations.

I won't even begin to detail all this here. We've dealt with all these matters in the SKEPTICAL INQUIRER now for years—and of course will continue to do so. Also, we have never limited ourselves to just the paranormal and pseudoscience. We deal with all topics at the intersection of science, public perception, and public misperception, with emphasis on those that attract large notice or that raise important public issues.

What I want to do here is sketch out some new and—I think—disturbing aspects of the cultural climate we find ourselves in and emphasize the higher values that CSICOP and the SKEPTICAL INQUIRER exemplify and promote—values that seem essential to a modern, progressive, humane society; values that are under assault from broad quarters of society here and abroad. No matter the specific, topical subjects we analyze and critique—the defense of these values is what we are really all about.

If thirty years ago Paul Kurtz and others were worried that we were in danger of descending toward a new dark age of superstition, paranormalism, mysticism, and pseudoscience, we in fact seem now to be in danger of descending toward a new dark age of a slightly different—and perhaps even more dangerous—sort. The first was

Kendrick Frazier is the editor of the SKEPTICAL INQUIRER. This commentary is based on his talk at the CSICOP 30th anniversary observance at CFI headquarters in Amherst, New York, April 1, 2006.

more one of credulous, wide-eyed acceptance of wondrous, incredible claims. In retrospect, it all has a certain air of innocence. These claims all had their counterparts, after all, in science and could be seen or interpreted as just misguided but understandable fascinations uninformed by real science. Show people the real science and they might easily—at least in principle—shift their support to it. UFOs → the Search for Extraterrestrial Intelligence. Astrology → astronomy. Van Däniken pseudoarchaeology → real archaeology. Psychic powers and parapsychology → experimental psychology and modern studies of neuroscience and cognition. And so on.

But the new areas you and I are most concerned about now aren't like that. Not at all. They arise from deep-seated ideologies. They arise from a dangerous capturing of mainstream, liberal, open-minded, religious viewpoints by those with far more extreme, narrow, rigid, authoritarian, judgmental religious viewpoints. They arise from a willingness, even a devout—many think God-sanctioned—determination to impose those viewpoints on everyone else. We've seen this abroad, but it is happening here in American too.

Their attacks are on many things, but among those that concern us here are—

The open-minded tolerance of others slightly different from oneself that marks a progressive society.

The love of learning and the quest for new knowledge that mark a progressive society.

The willingness to entertain and examine new ideas that marks a progressive society.

A free and open society's distrust of authoritarian dogma, whatever the source—biblical or otherwise.

Freedom of expression and the clear separation of church and state on which this nation was founded.

Reliance on science-based evidence over unexamined belief and prejudice.

The basic rights of women to make their own choices, to be educated, and to shape their own futures.

A deep appreciation for education and a nurturing of environments for creativity and achieving novel solutions to problems.

A related deep appreciation for not just the useful achievements of science but for the methods of science in determining and advancing provisional new truths, small and large, about the natural world.

An acceptance that those methods of science often result in reliable judgments about what is real and what is not.

The new areas we are most concerned about arise from deep-seated ideologies. They arise from a dangerous capturing of mainstream, liberal, open-minded, religious viewpoints by those with far more extreme, narrow viewpoints.

A realization that we humans—while unique in our humanity—are nevertheless part of the natural world, and derived from and influenced by a long co-evolutionary history with the other life forms, large to microscopic, of the natural world.

In short, these attacks are on many key aspects of the modern world first shaped by the Enlightenment and the beginnings of science—when we began to develop the first abilities to actually deeply understand nature and, to some degree, exert some fledgling, limited controls of it for the well-being of people. They are attacks on curiosity and learning and on the scientific outlook itself. They are attacks on intellectual inquiry and thought—the open-minded, no-holds-barred examination of competing ideas and claims that is essential to an open, democratic society.

In many respects — although their proponents in America would no doubt dispute being so characterized—these are attacks on democracy itself. For these fundamentalist partisans would—if allowed—willingly impose their own, very specific ideological views on those they oppose.

We have to fight these trends.

We *will* fight these trends.

Our efforts at CSICOP and in the SKEPTICAL INQUIRER can't and don't deal with these issues in the abstract. Instead, we examine, critique, review, and report on specific, concrete topics, within the broad context of science and reason.

But it is important to keep in mind the higher values we nevertheless are defending:

- Reason and rationality, among the highest, most hard-won attributes of thinking, independent people.
- The scientific outlook, with its rich tradition of creative, open-minded, empirical inquiry and evidence-based probing of nature's secrets.
- The skeptical attitude, a key component of the scientific outlook, with its obligation to put all new assertions to tests of empirical evidence.
- The traditions of learning—real learning, deep and broad—and the value of education not only in achieving a better life for each person but in creating reflective minds and in improving the lot of society.
- The deepest traditions of democracy—valuing human dignity and rights, drawing on the free and open interplay of ideas, and depending upon an educated, informed citizenry for making wise decisions.

No small matters. No small challenges.

Are we up to it? We have to be. There is no choice. □

Riddle of the Crystal Skulls

Here and there around the world are found mysterious artifacts, crystal skulls that many New Age enthusiasts believe possess mystical powers. Now new claims—and new reviews of the evidence—spark further controversy. What is the truth about these remarkable objects?

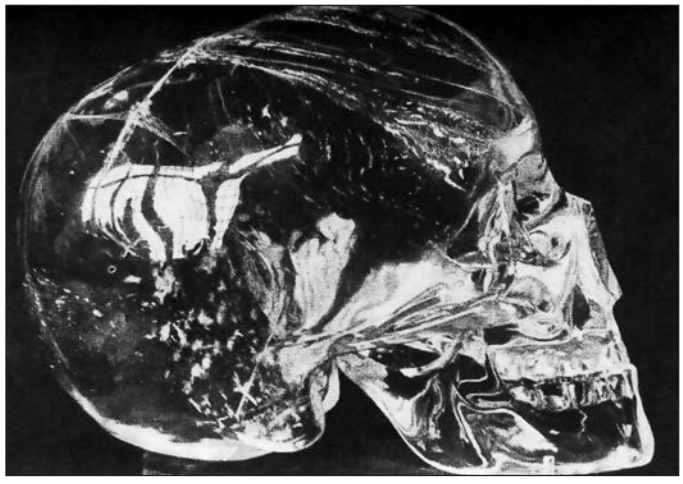

Figure 1. The Mitchell-Hedges "Skull of Doom"—carved from a block of rock crystal, allegedly by the ancient Mayans—is shown as it appeared in the July 1936 *Man*, at which time it was owned by art dealer Sidney Burney.

"Skull of Doom"

Perhaps the most famous of the artifacts—dubbed "the weirdest gem in the world" (Welfare and Fairley 1980, 51) and "the granddaddy of all crystal balls" (Garvin 1973, 6)—is the one commonly known as the Mitchell-Hedges crystal skull. It is referred to as "the Skull of Doom" by those who believe it holds the power of death over anyone who would mock it (Nickell 1988, 30).

Fashioned from a single block of natural rock crystal (massive clear quartz) although its lower jaw detaches, it weighs 11 pounds 7 ounces. It allegedly first came to light in 1927 (or 1926 or 1924) during the excavation of a lost Mayan citadel in Belize (then British Honduras). The adventurer F.A. Mitchell-Hedges participated in the work, and it was supposedly his young adopted daughter, Anna, who found it under an altar of the ruined city of Lubaantun (from the Mayan word for "place of fallen stones"). (See figure 1.)

Mitchell-Hedges mentioned the skull in the first edition of his autobiography, *Danger My Ally* (1954), yet did not specify where or by whom it had been found. He merely published a photograph of what he called "the sinister Skull of Doom," stating in his customarily glib fashion: "It is at least 3,600 years old and according to legend was used by the High Priest of the Maya when performing esoteric rites. It is said that when he willed death with the help of the skull, death invariably followed." Of the skull's provenance, Mitchell-Hedges said only that "How it came into my possession I have reason for not revealing." As if that were not mysterious enough, later editions of *Danger My Ally* omitted all references to the skull, an action which the publishers disclaimed knowledge of.

To answer the many questions posed by the crystal skull—specifically, Did Anna Mitchell-Hedges indeed find it at Lubaantun or, if not, where did it come from? and, Does the skull actually have the mystical powers ascribed to it?—I began an investigation with my forensic colleague John F. Fischer that ran from 1982 to 1984. We obtained as much data on the skull as possible: we combed through old newspaper records; corresponded with major museums and laboratories; consulted distinguished experts; amassed information on the Maya, on rock crystal, on the skull motif in art; and sought out those who had examined the skull, as well as Anna Mitchell-Hedges herself.

So far as is known, F.A. Mitchell-Hedges—a habitual liar and faker (Nickell 1988, 38; McConnell 1998)—made no reference to the skull at the time of his return from Lubaantun or in the years immediately following. In the 1930s he wrote newspaper articles and a book that discussed Lubaantun at length, but omitted the "Skull of Doom" in favor of relatively humble figurines.

Joe Nickell is CSICOP's Senior Research Fellow. His Web site is www.joenickell.com.

Evidence Uncovered

In fact, as we discovered, the earliest published reference to the celebrated skull—the July 1936 issue of *Man* (a British anthropological journal)—makes no reference to the adventurer. Instead the skull was described as "in the possession of Mr. Sydney Burney," a London art dealer (Morant 1936, 105).

Moreover, there is documentary evidence that Mitchell-Hedges bought the skull in 1944 from Burney, who was said to have owned it for the preceding ten years (Morrill 1972, 28; Welfare and Fairley 1980, 53). Anna Mitchell-Hedges has attempted to rationalize this damning evidence by claiming—in a letter to me—that her father had left the skull with Burney "as security for a loan to finance an expedition" (Mitchell-Hedges 1983).

Asked if she had any record—such as a letter or newspaper clipping—that might help establish her father's prior ownership of the skull, Anna Mitchell-Hedges (1983) replied that she had "no documentary evidence" but added, "all my father's papers were lost in Hatteras during a cyclone—photographs and all—also a trunk of his belongings was lost in Plymouth." Be that as it may, none of those who were actually at Lubaantun ever mentioned Anna being at the site or the skull being discovered there (Nickell 1988, 35–36).

Subsequently, a letter surfaced that further discredits Anna Mitchell-Hedges's claim that she discovered the crystal skull at Lubaantun. Written by Sydney Burney to George Vaillant of the American Museum of Natural History, it makes clear that Burney had the skull at that time (March 21, 1933), and that he had indeed "bought it" from an unnamed collector (Burney 1933).

Clearly F.A. Mitchell-Hedges's crystal skull did not come from Lubaantun, but he acquired it later from Burney. This might explain why references to the skull were deleted from subsequent editions of *Danger My Ally*. No doubt in 1954 (some three years after Sydney Burney's death) there were persons who could recall Burney's prior ownership of the skull and its sale to Mitchell-Hedges. Might not such a person have threatened to expose the deceiver?

We had hoped to conduct an examination of the skull in anticipation of learning more about its origins, and we had contacted various experts—including famed microanalyst Walter C. McCrone—about additional analyses that might be performed. Disappointingly, however, Anna Mitchell-Hedges (1973) refused. Nevertheless, we learned that, contrary to assertions that the skull lacked any evidence of modern workmanship, there were "traces of mechanical grinding" on the teeth (Dorland 1973) and holes, intended for support pegs, that were drilled by metal (Hammond 1983).

Further Claims

There remained many fanciful assertions about the skull. In his autobiography, F.A. Mitchell-Hedges (1954) described the "Skull of Doom" as "dating back at least 3,600 years, and taking about 150 years to rub down with sand"; the rock crystal, he exaggerated, was "nearly as hard as diamond." He said further of the skull: "It is stated in legend that it was used by a high priest of the Maya to concentrate on and will death. It is said to be the embodiment of all evil; several people who have cynically laughed at it have died, others have been stricken and become seriously ill." Or so "it is said." Richard M. Garvin, author of *The Crystal Skull* (1973, 100), concluded: ". . .the claims that the crystal skull has caused or can cause death should most likely be filed right next to the curses of old King Tut."

Other claims about the skull also failed to survive scrutiny. One was that it remained at a constant temperature of 70° Fahrenheit regardless of the temperature it was subjected to. In fact, the skull was no different in its physical properties from other natural quartz crystals, according to California art expert Frank Dorland (1983).

Mystical properties of the skull—perceived sounds of silver bells and images such as faces—are probably only what Garvin (1973, 100) terms "the result of intense concentration and meditation."

Less in touch with reality is the approach of one Joshua Shapiro, who, with others, has had channeling sessions to seek psychic impressions from the crystal artifact. These led him to opine that it was an "ancient computer" storing messages for humanity. Instead of a Mayan origin, he posits that the skull could be from a lost civilization or even some extraterrestrial site (Hunter 2005).

Closer to earth, at age ninety-eight Anna Mitchell-Hedges told reporter Colin Hunter (2005) that the skull was the secret to her longevity. Hunter had made a pilgrimage to visit her at a friend's home in Indiana. She stuck to her story about having found the skull at Lubaantun, although continuing to give conflicting versions of the facts. Hunter's investigative report reviewed my findings and essentially substantiated and augmented them.

As to the true origin of the Mitchell-Hedges crystal skull, there is little evidence beyond the object itself, the meager historical record, and some similar rock crystal skulls in museums and private collections.

Additional Skulls

Various other crystal skulls exist, ranging from as small as an inch in width to a half-life-sized one in the Musée de l'Homme (Museum of Man) in Paris and other life-sized examples, notably one in the British Museum. They are generally classified as Aztec, but there are doubts that any of them are pre-Colombian, according to Gordon F. Ekholm (1983), an anthropologist from the American Museum of Natural History.

At least one, the British Museum skull, has recently been scientifically examined. Although fashioned in a single piece and having more stylized, circular eye sockets than the Mitchell-Hedges skull, it nevertheless looks remarkably like it (Nickell 1988).

Ian Freestone, former head of the museum's scientific research and now a professor at the University of Wales, led a museum team that conducted the

examination. The scientists used dental resin to obtain casts of the skull's surface, then studied them with a scanning electron microscope. According to professor Freestone: "It does appear that in some areas of the skull they have used a rotary tool, and as far as we know that sort of technique was only introduced after the Europeans came to the Americas, so it's post-Columbus." He also observed that the type of rock crystal used has never been found in Mexico, the domain of the Aztecs.

The evidence led Freestone to conclude that the skull was likely a fake, apparently fashioned from a lump of rather poor quality Brazilian crystal. The great gem's cutting and polishing was probably done by a lapidary in nineteenth-century Europe, perhaps Germany, who used a rotating wheel like those common to the jewelry houses of that place and time (Pennink 2005; Connor 2005).

In recent years, yet another skull—dubbed "Max," the Texas Crystal Skull—has surfaced. It is billed as the "largest ancient crystal skull," and is reputed to be up to 36,000 years old. However, despite the allegation that it was "found in a tomb in Guatemala between 1924 and 1926" ("Max" 2005), there appears to be no documentation of that claim. Rather, the skull's owner, a JoAnn Parks of Houston, reportedly received the skull from one Norbu Chen, a "Tibetan Healer" whom she met in 1973. Before his death he gave her and her husband the artifact which they kept in a closet from 1980 to June 1987, while "Max" talked to her in her dreams. Then, seeing a television program on UFOs that featured the Mitchell-Hedges crystal skull, they began to publicize Max.

According to Parks, Max says he comes both "from Pleiades" (a group of stars in the constellation Taurus) and "Atlantis" (the mythical continent). Parks adds: "He is a gift to mankind. He's here as a teacher, and as a tool, to bring people together as a Oneness. . . . He seems to open up an energy in the mind. . . . People pick up visions of the past, of other planets and some are creatively inspired. They feel healing . . ." (Max 2005).

Toward a Solution

Interestingly, Jane Walsh, an archivist at the Smithsonian Institution, has uncovered documents showing that at least two of the crystal skulls were sold by the same man, a French collector of pre-Columbian artifacts named Eugene Boban. The British Museum purchased its skull in 1897 from Tiffany's, the New York jeweler, which in turn had bought it from Boban. (Boban had earlier attempted to sell it to the Smithsonian.) And the skull at the Musée de l'Homme in Paris was donated by a collector who likewise purchased it from Boban (Connor 2005).

From what we know, it is conceivable that the Mitchell-Hedges skull was also sold by Boban. Putting aside the discredited claim that it was discovered at Lubaantun, the skull's provenance traces back to Sydney Burney who owned it as early as 1933. He wrote that it was "for several years in the possession of the collector from whom I bought it and he in his turn had it from an Englishman in whose collection it had been also for several years" (Burney 1933). But where did the English collector get it?

A possible source for many of the crystal skulls was the renowned gemstone center of Idar and Oberstein in Germany. The area underwent a resurgence in the 1870s with the shipment of quartz crystals from Brazil. Those were carved into various objects—including "even a few crystal skulls"—by the region's skilled artisans. (See Max 2005, which displays a modern example; see also Kunz 1913, 54.)

New Agers assert that, according to "prophecy," one day thirteen authentic ancient crystal skulls—all reputedly from Mexico or Central America—will be brought together and, by uniting people of all races, will heal the earth (Max 2001; Smoker 1995). Yet none of the famous skulls appears to be pre-Columbian, and all may, in fact, be European forgeries.

The chief power of the skulls seems to be that of attracting the credulous, including some with fantasy-prone personalities, and transporting them to a mystical realm from which they return with addled senses. It seems likely that further revelations about the crystal skulls will best come, not from channeling sessions, but from science and scholarship.

Acknowledgments

The portion of this article regarding the Mitchell-Hedges crystal skull is largely abridged from my book *Secrets of the Supernatural* (Nickell 1988). Also, once again I am indebted to Timothy Binga, Director of the Center for Inquiry Libraries, and Vaughn Rees for research assistance.

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When Philosophy Matters

Philosophy is often accused of being out of touch with reality, the esoteric pursuit of a vanishing academic elite that all but forgot about Socrates' habit of roaming the streets of Athens and talking to the local youth about the "love of wisdom." Philosophy of science, perhaps, suffers from an even worse image problem, being often shunned even by that *other* out-of-touch, academic elite—scientists themselves.

It was therefore refreshing to see that a few months ago, philosophy of science was the deciding factor in a landmark legal decision in defense of science, the Dover, Pennsylvania, case against the teaching of so-called intelligent design in public schools there. Not only were there two philosophers (Barbara Forrest, of Southeastern Louisiana University, and Robert Pennock, of Michigan State University) among the chief witnesses at the trial, but even scientists like Ken Miller, a cell biologist at Brown University, made ample use of philosophical talking points.

The result was a 139-page decision handed down by Judge John Jones (a conservative appointed by George H. W. Bush, and hence beyond suspicions of "liberal activism"), which revolves around a core section, titled "Whether ID is science" (section 4, pp. 64–89). Jones's decision is compelling, and possibly a fatal blow to the legal aspirations of the ID movement; more to the point of this column, it is a fine example of how philosophy matters in everyday life, considering that it will affect the education of countless children in Pennsylvania and likely, eventually, around the country.

Jones found that ID fails to be science based on three points: a) it violates the centuries-old ground rule that science cannot entail supernatural explanations; b) the central argument of ID, the so-called "irreducible complexity" of biological structures, is an example of the logical fallacy of false dichotomy; and c) ID's attacks on evolution have not only been refuted by the scientific community but, for philosophical reasons, would not matter even if successful, because they do not represent a positive argument in favor of ID.

Concerning the first point, the ground rule that disallows supernatural explanations in science, Jones cites the philosopher Robert Pennock as an expert witness to the fact that the scientific revolution of the sixteenth through seventeenth centuries has been successful precisely because it permanently excluded the supernatural realm from the sphere of scientific discourse. Jones is very careful in repeating several times that this isn't an argument against the existence of God (an important philosophical point in its own right, often ignored by philosophically naïve scientists such as Richard Dawkins). Indeed, the judge explicitly invokes the crucial concept of methodological naturalism, the idea that supernaturalism is kept out of science not as a result of an atheistic position but as a pragmatic device that allows science to proceed in its quest. Supernatural "explanations" are, as Miller puts it in his testimony, a "science stopper." (Amusingly, in a cross-examination, Michael Behe was forced to admit that if science were to be broadened sufficiently to encompass ID, astrology would qualify too.)

Second, Jones notes that the idea that irreducible complexity is a challenge to evolution is built on a logical fallacy. In particular, the judge refers to a previous landmark decision, *McLean v. Arkansas Board of Education* (1982), in which standard creationism was defeated on the grounds that it is based on a "contrived dualism": even if Behe and company could convincingly show that current evolutionary theory cannot explain sufficiently complex structures, that would do precisely nothing to advance the ID cause, since there are many other possible alternatives, including scientific theories that improve on or supersede the Darwinian one. As paleontologist Kevin Padian (another expert witness for the plaintiff) put it, "absence of evidence is not evidence of absence." (This is deliciously ironic, since it is a favored

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argument of supernaturalists and pseudoscientists, and betrays a fundamental misunderstanding of science: scientists are not rejecting, say, paranormal phenomena because they can demonstrate that they don't exist, but rather because the positive claim for their existence is not sufficiently backed by empirical evidence.)

Finally, Judge Jones noted that ID's attacks against evolution have been refuted in the academic arena. For example, Miller explained to the court how scientists have in fact discovered simpler structures related to, and functionally distinct from, the infamous bacterial flagellum—exactly as evolutionary theory predicts. Plenty of peer-reviewed studies have also shown that there are, in fact, simpler versions of the blood-clotting cascade, another staple of "(not quite so) irreducible complexity." And finally, Behe's claim that there isn't a single paper explaining the evolution of the immune system has been (metaphorically) laughed out of court. But Jones's crucial third argument here is, again, philosophical. All these examples show that the concept of irreducible complexity is, in fact, falsifiable (and has been falsified). But these are tests of *evolution*, not of ID (as even the witnesses for the defense had to admit during the trial), which means—again—that ID isn't science for the philosophically sound reason that it has failed to provide a single empirically testable hypothesis. Indeed, Jones nails the coffin by saying that "the ID argument is dependent upon setting a scientifically unreasonable burden of proof for the theory of evolution," a classical type of logical fallacy.

Judge Jones has handed down a crucial legal victory to science education, which has largely been a courtesy of a sophisticated philosophical understanding of the debate. And you thought philosophy was irrelevant. □

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Houdini's Impossible Demonstration

For a few years, magician Harry Houdini and British writer Sir Arthur Conan Doyle, creator of the Sherlock Holmes stories, were friends. One was an arch-skeptic (Houdini), while the other was a true believer in Spiritualism (Doyle).

Possibly hoping to show Doyle how easy it is to be fooled by mediums, Houdini once gave his friend an extraordinary demonstration, in his own home, in the presence of Bernard M.L. Ernst, Houdini's friend and lawyer. Ernst's memoirs reveal what happened that night.

Mene, mene, tekel upharsin

> Houdini produced what appeared to be an ordinary slate, some eighteen inches long by fifteen inches high. In two corners of this slate, holes had been bored, and through these holes wires had been passed. These wires were several feet in length, and hooks had been fastened to the other ends of the wires. The only other accessories were four small cork balls (about three-quarters of an inch in diameter), a large ink-well filled with white ink, and a table-spoon.
>
> Houdini passed the slate to Sir Arthur for examination. He was then requested to suspend the slate in the middle of the room, by means of the wires and hooks, leaving it free to swing in space, several feet distant from anything. In order to eliminate the possibility of electrical connections of any kind, Sir Arthur was asked to fasten the hooks over anything in the room which would hold them. He hooked one over the edge of a picture-frame, and the other on a large book, on a shelf in Houdini's library. The slate thus swung free in space, in the center of the room, being supported by the two wires passing through the holes in its upper corners. The slate was inspected and cleaned.
>
> Houdini now invited Sir Arthur to examine the four cork balls in the saucer. He was told to select any one he liked, and, to show that they were free from preparation, to cut it in two with his knife, thus verifying the fact that they were merely solid cork balls. This was accordingly done. Another ball was then selected, and, by means of the spoon, was placed in the white ink, where it was thoroughly stirred round and round, until its surface was equally coated with the liquid. It was then left in the ink to soak up as much liquid as possible. The remaining balls Sir Arthur took away with him for examination, at Houdini's request.
>
> "Have you a piece of paper in your pocket upon which you can write something?" asked Houdini to Doyle. He had a pencil.
>
> "Sir Arthur," continued Houdini, "I want you to go out of the house, walk anywhere you like, as far as you like in any direction; then write a question or sentence on that piece of paper; put it back in your pocket and return to the house."
>
> Doyle obeyed, walking three blocks and turning a corner before he wrote upon the paper. When he returned Houdini invited him to take a spoon and remove the cork ball, which had been soaking in the white ink, then to touch the ball to the left side of the slate. The ball "stuck" there, seemingly of its own volition. Slowly, it began rolling across the surface of the slate, leaving a white track as it did so. As the ball rolled, it was seen to be spelling the words: "Mene, mene, tekel upharsin," the very same words that Doyle had written. The guests were speechless.
>
> Houdini turned to Doyle and said: "Sir Arthur, I have devoted a lot of time and thought to this illusion; I have been working at it, on and off, all winter. I won't tell you how it was done, but I can assure you it was pure trickery. I did it by perfectly normal means. I devised it to show you what can be done along these lines. Now, I beg of you, Sir Arthur, do not jump to the conclusion that certain things you see are necessarily 'supernatural,' or the work of 'spirits,' just because you cannot explain them. This is as marvelous a demonstration as you have ever witnessed, given you under test conditions, and I can assure you that it was accomplished by trickery and by nothing else. Do, therefore, be careful in future, in endorsing phenomena just because you cannot explain them. I have given you this test to impress upon you the necessity of caution, and I sincerely hope that you will profit by it."

"Sir Arthur," remembered Ernst, "came to the conclusion that Houdini really accomplished the feat by psychic

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aid, and could not be persuaded otherwise." Doyle's reaction, and the refusal to consider trickery even when admitted by the trickster, was so typical, noted Houdini, that "here is little wonder in his believing in Spiritualism so implicitly."

Berol's Secret

The secret of the trick remained a mystery for years until magician and historian Milbourne Christopher revealed it in his book *Houdini, A Pictorial Life.* "Neither Doyle nor Ernst," wrote Christopher, "could fathom this mystery. They might have been less startled had they seen Houdini's friend Max Berol perform in Vaudeville." Berol had been performing for years, both in Europe and America, an act in which a ball dipped in ink would spell on an isolated board the words called out by members of the audience:

"Berol did this by switching a solid cork ball for one with an iron core. A magnet at the end of a rod, manipulated by an assistant concealed behind the board, caused the ball to adhere and move—apparently under its own power. After Berol retired, Houdini purchased the equipment. An assistant in the room adjacent to Houdini's library had opened a small panel in the wall and extended the rod with a magnet through it. The ball on the slate had an iron center, of course.

"Ernst had not remembered that when Doyle returned to the room, after writing the words outdoors, Houdini had checked to make sure the slip of paper on which Doyle wrote was folded, then immediately returned it to his friend. Before doing so, the magician had switched slips. While Doyle was busy retrieving the ball from the inkwell and taking it to the board, Houdini read the words. His conversation cued his hidden assistant. Once the message had been written on the slate, Houdini asked Doyle for the folded slip to verify his words. He opened the blank paper, pretended to read from it, then switched it for the original as he returned the paper to his friend. Later, Houdini explained this switching process during his public lectures on fraudulent mediums." □

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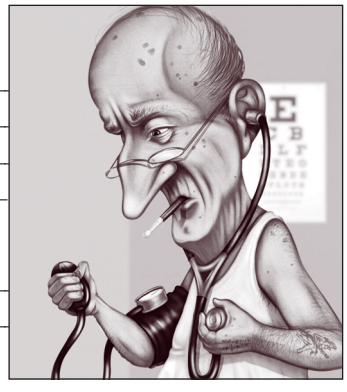

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The Internet: A Shining Beacon of Truth

Where have all the UFOs gone? In recent months, three widely read articles have been published by thoughtful observers, suggesting that UFOs are no longer being seen because they've been "chased off by the Internet." This represents the first time, to my knowledge, that anyone has suggested with a straight face that the Internet kills off nonsense and misinformation almost as effectively as Raid kills roaches.

First, this past November 9, Douglas Kern suggested in the online journal *Tech Central Station* that the "Internet Killed the Alien Star" (see www.techcentralstation.com/110905A.html). He writes that "the rise of the Internet taught the world to be more skeptical of unverified information," apparently wholly unaware of the Internet's role in promoting and spreading the wildest conspiracy stories about the September 11 attacks that are now finding increasingly wide acceptance. He seems to think that widespread belief in UFOs was a nineties thing, like disco globes in the seventies: "I'm quite happy to leave the aliens in the nineties, and on the milk cartons." Yet it is only since 2003 that the alleged 1965 UFO crash at Kecksburg, Pennsylvania, has assumed classic proportions, abetted by a sensationalist "documentary" on the Sci-Fi Channel—and of course by the Internet. This is in spite of skeptical information readily available since the early 1990s that the "crash" was nothing more than hysteria over the Great Lakes Fireball of December 9, 1965 (see "'Old Solved Mysteries': The Kecksburg Incident," by Robert R. Young, *SI*, Spring 1991). If Kern is correct, belief in the Kecksburg crash and the September 11 conspiracies should be fading away, not growing.

Next, on March 31, Ben Macintyre wrote in *The Times* of London that the ETs had "flown home—chased off by the Internet" (see www.timesonline.co.uk/article/0,,1068-2111848,00.html). He suggests that "The Internet works by taking in vast swaths of hokum and ignorance but it gradually sifts out the chaff." He seems to think this is an automatic process, like old cars falling apart, forgetting that it takes human effort to make it happen. Today's UFO proponents are as willfully blind to skeptical information on the Web as they were in the days when it was available only in print, and TV producers seeking sensationalism and the sensational ratings it brings can ignore skeptical Web sites as easily as they did skeptical books. Correction of error is a process requiring human intervention, and so long as there are many humans who find misinformation more charming than fact, error will flourish, no matter how readily available the facts are.

Finally, on April 22, Iain Hollingshead asked in *The Guardian,* "Whatever happened to . . . UFOs?" (www.guardian.co.uk/comment/story/0,,1758839,00.html). He suggested, "it would appear that public interest in UFOs has waned significantly since the 1970s film *Close Encounters of the Third Kind*." Note that Hollingshead thinks that the heyday of UFOs was the 1970s, while Kern thinks it was the nineties. Hollingshead continues, "Today, however, rational explanations appear to exist for most UFO sightings," as if they did not in the 1950s and 1960s, when the U.S. Air Force gave explanations for about 95 percent of reports it received (and even the late Dr. J. Allen Hynek, while criticizing and reevaluating the Air Force data, came up with nearly identical percentages). Of course, UFO zealots derided and ignored rational explanations printed during the 1950s as easily as they do those posted on skeptical Web sites today. Hollingshead does not directly blame the Internet for killing off UFOs, suggesting only that "the craze has simply run its course," although he quotes Roy Lake of London UFO Studies as saying, "The Internet killed it off."

None of these fine gentlemen has any background in the UFO field, or has made any detailed investigations of any cases. None seems to realize that the last large-scale classic wave of "UFO sightings" in the U.S. occurred in 1973, about twenty-five years before the

Robert Sheaffer's World Wide Web page for UFOs and other skeptical subjects is at www.debunker.com.

Internet would be able to exert any noticeable cultural effect. Perhaps the Future Shock of the coming Internet revolution set up a shockwave that traveled back in time and squelched the sightings? In reality, the widespread availability of color TV probably played a much bigger role than anything else in dampening UFO sightings, by keeping people indoors and well-entertained and not outdoors, where they might puzzle over Venus or a weather balloon. (Color TV sets were scarce in the mid-sixties, and did not reach a majority of TV households until 1972.)

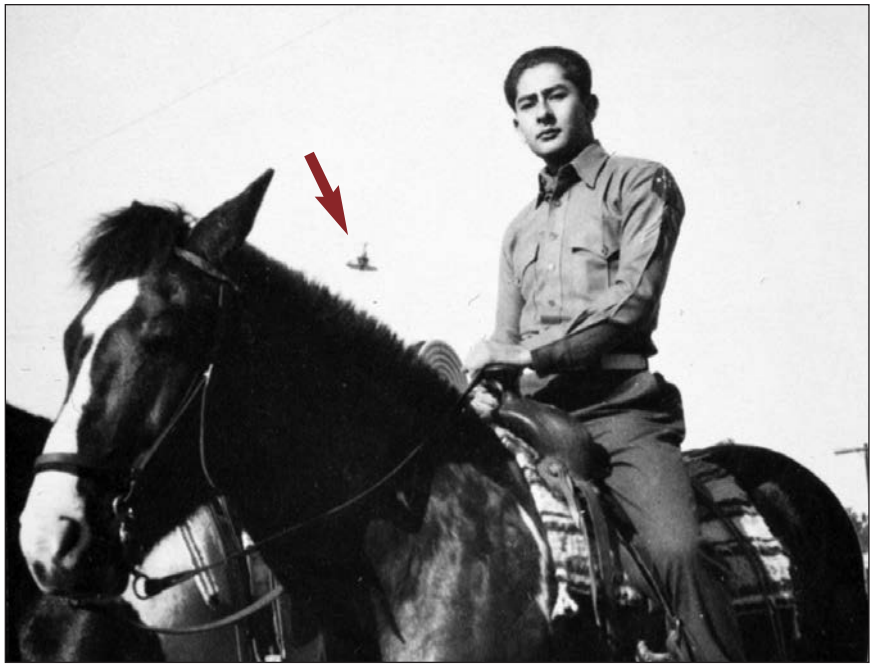
If peak interest in UFOs can be equated to peak reports of sightings, then the peaks occurred in 1952, 1957, and 1966. UFO sightings and related claims have always come in waves, with pronounced peaks and valleys. We do indeed seem to be in a valley at the present time, but it is wrong to conclude from this that we will never again see a peak. I well recall the deep UFO valley experienced during the mid-1980s. There were some at this time who pronounced that UFOs had run their course and would never fly again. I also recall the late Philip J. Klass chuckling over such pronouncements, saying, "UFOs can't be killed off so easily. They'll be back!" And events soon proved Klass correct.

In 1987, Bill Moore and Jamie Shandera made a huge splash announcing the "discovery" of supposedly secret government papers about a crashed-saucer group known as MJ-12, and government UFO conspiracies were soon all the rage. This craze, like all others, ran its course, but Hopkins/Jacobs/Mack-style UFO abductions were quickly rising to augment it, and when these in turn began to fizzle, new crash-conspiracy yarns from Roswell and elsewhere sounded fresh and exciting enough to generate their own buzz for a few years. Now that all these excitements have been widespread for several years and have led nowhere, just like all previous mega-claims, the field will remain quiet until some new-sounding gimmick or angle grabs the public's attention in a big way. Novel UFO claims typically swell up quickly among UFOlogists, but as soon as it's clear to most of them that their newest treasured evidence is not going to be the long-awaited Holy Grail that will finally reveal the truth about UFOs to an unbelieving world, they start losing interest in it.

"It's hard to remember just how large UFOs loomed in the public mind a mere ten years ago," writes Kern, trying to jog the reader's distant memories by bringing up sensationalist TV shows about Roswell and the like. Apparently he has not been watching television recently. On March 16, the History Channel gave us five hours of uninterrupted UFO inanity, including some of the worst sensationalist twaddle masquerading as documentary fact that I've ever seen. *Real UFOs* included confident assertions about supposed "Nazi flying saucers," claims founded upon, well, other claims, which in turn are based upon still earlier claims, and so on. Despite decades of such claims, remarkably growing stronger and more widespread despite the reported UFOcidal effect of the Internet, nobody has yet turned up a single photograph or blueprint of any saucer-shaped craft allegedly created by the Third Reich. Despite this breathtaking dearth of evidence, the History Channel confidently assured us that the Nazi saucers flew using "magnetic effects" to produce "levitation," a trick that would still baffle present-day science, assuming it were actually done.

This abomination of disinformation was followed by a two-part show *Alien Engineering*, which was acknowledged to be based solely on imagination and conjecture. In that show, a hypothetical panel of expert scientists is invited to examine a hypothetical UFO that is alleged to have crashed at Roswell. The panel discovers that the UFO flew using "inertia cancellers" to allow it to make sharp turns at high speeds. This makes it sound like a device we might start building next week, except that physics offers no theories of how a workable "inertia canceller" might function. The saucer's propulsion system was "found" to operate using either an "anti-gravity drive," or else a "force-field generator"—apparently even top scientists can't always agree on such details. To solve the problem of faster-than-light travel, the saucer was said to employ a "wormhole generator" with a "stabilizer" to keep the wormhole open—those pesky wormholes keep closing up if you forget to turn on your stabilizer. No explanation was given of how the saucers grab onto the fabric of space-time to warp and rend it, but in the Land of UFOria, such explanations are not needed. While such terms may sound perfectly reasonable to a generation raised on *Star Wars* and

UFO sightings and related claims have always come in waves, with pronounced peaks and valleys. We do indeed seem to be in a valley at the present time, but it is wrong to conclude from this that we will never again see a peak.



The 1945 "Jack LeMonde" UFO photograph.

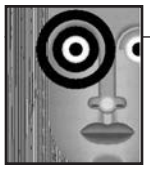
Star Trek, to anyone who has studied physics, they are little more than gibberish. Then, on March 27, the History Channel again served up a heaping platter of junk food in the form of a documentary on the Bermuda Triangle. I don't know why the Internet's Truth Beacon hasn't yet shot down that specious claim (let alone the abysmally inaccurate history now so fashionable in *The Da Vinci Code*).

Meanwhile, the buzz among certain "serious" UFOlogists is that the recent sudden shakeup at the CIA is related to "exopolitics," the supposed diplomatic dealings between the U.S. government and extraterrestrials. Ed Komarek, a tireless advocate for supposed "UFO disclosure," writes that "In the 1950s treaties seem to have been made in secret under the highest security between the United States government and one or more extraterrestrial races." On May 8 he wrote, "It has been suggested that [anonymous] has been close to Porter Goss who has recently resigned as head of the CIA. It has also been suggested that [anonymous] is pro [UFO] disclosure or at least not inclined to stand in the way of disclosure. Also suggested is that there has been a move afoot within the CIA pressing for disclosure, with [anonymous] being a key figure." So there you have it—Goss was preparing to spill the beans about saucers, and thus had to go. Komarek probably knows the secret handshake that gets him info on all the UFO conspiracies.

It was Marty Kottmeyer who gave us the best insight into what is really happening: UFOs as an "evolving system of paranoia," adapting itself to the peculiar obsessions and fears of its host society. It is not difficult to see the origins of early flying-saucer reports and the claims of 1950s "contactees" in Cold War fears over atomic weapons and missiles. As American society gradually evolved toward other concerns and fears, our fantasies changed with it. By the 1980s, popular obsessions over "victimology" and New Age narcissism caused claims of clandestine "UFO abductions" to be far more compelling than mere sightings of lights in the sky. When Budd Hopkins published his *Missing Time* in 1981, claiming that aliens were sneaking into peoples' bedrooms late at night and secretly beaming sleepers up to hovering saucers, the book spoke directly to the popular culture of its time, and the world of UFO belief was forever changed. In this Age of Oprah, people do not obsess over possible ETs flying overhead, but instead over what invisible ETs might secretly be doing to *them.* By the late nineties, Hopkins-style "abductions" were starting to lose their pizzazz (even UFOlogists get bored with claims that go on for decades but somehow never get confirmed), so the big push over Roswell "crashed-saucer" claims largely supplanted them as the focus of UFOlogy. Today, conspiracy theories are all the rage, and the best way to become famous in UFOlogy is to think up a new one that will grab peoples' fancy. If the Internet killed off UFOs, what are all those aliens doing on my TV screen?

* * *

The 1945 UFO photograph known as the "Jack LeMonde" photo (a pseudonym meaning "the world") created a lot of interest in "serious" UFOlogical circles when it first surfaced in 2000 (see www.nidsci.org/news/lemonde.php). It shows a young Marine seated on a horse, and was taken at a riding stable in Burbank, California. Behind him, a round metallic-looking object is clearly seen, with a tall and ornate tower protruding. Because "flying saucers" were unknown in 1945, the "blemished" photo was quietly pasted away in a family photo album, its "saucer" only attracting attention much later. UFOlogist John Alexander recently met with the now-elderly "Jack LeMonde," and was impressed by his sincerity and modest ways. However, objections soon began to be raised, suggesting that the "UFO" was just a light fixture suspended on a wire. Alexander held fast, arguing that no supporting wire could be seen in the photo (perhaps not realizing how easy it was for such small details to get washed out), and that the city of Burbank was using different streetlights at the time, anyway. Recently, a French-language Web site (http://rr0.org/Dossier/1945_LeMonde) revisited the photograph, showing how an enhancement of contrast does indeed bring out something looking very much like a wire running over to the "UFO." Furthermore, a photo was located that shows a hanging streetlamp in nearby Pasadena used since the 1930s, identical to the UFO in the photo. No word from Alexander or other UFOlogists about whether they're ready to relinquish this treasure. □



SKEPTICAL INQUIREE
BENJAMIN RADFORD

Please Pass the Globster

Q: What is a globster and where can I find one?

—D. Musella

A: A globster (or "blobster") is a huge, smelly, often whitish mass of flesh found on beaches throughout the world. No, not tourists—dead "sea monsters." "If sea serpents exist, why don't we have a body?" asks cryptozoologist Loren Coleman, in his field guide to sea serpents. "Well, we do. Dozens and dozens of odd carcasses, strange live catches, and huge lumps of decaying tissue… have been recovered. But what are they, exactly? Identifying often partial and decomposing remains is no easy task."

The blobsters are obviously flesh, yet have decayed so badly that they lack bones or distinguishing features. For many people, the huge, strange creatures strongly resemble sea monsters. One classic globster washed ashore in 1896, when giant waves tossed a massive fleshy corpse on a beach at St. Augustine, Florida. The rubbery, six-foot-high blob was examined by a local naturalist, who initially speculated that it was likely from a giant octopus far larger than any previously seen. Many other such blobs have washed ashore, including one in Chile in July 2003 and another in Newfoundland in 2001. There's also the Tasmanian West Coast Monster, the Nantucket Blob, and two so-called "Bermuda Blobs," the most recent of which washed ashore on Bermuda island in 1988. Controversy and mystery surrounded the creatures for decades, as definitive identifications eluded researchers.

In a series of articles for his publication *The Cryptozoology Review*, Canadian marine biologist Ben Roesch examined the original accounts of over two dozen alleged sea serpent carcasses found between 1648 and 1924. He concluded that the creatures "often turn out to be basking sharks, whales, oarfish, or some other known creature." In some especially puzzling cases—where the information was highly suspect or especially sketchy—even a tenuous identification was impossible.

A team of biologists led by Sidney Pierce began looking into the mystery and tried to settle the issue. As the authors pointed out, "Wild claims, especially in the nonscientific literature, are regularly made that the blobs are the remains of sea monsters. For example, the Tasmanian West Coast Monster is still referred to as a monster, although an Australian scientific team . . . identified it as a whale. Other relics such as the St. Augustine (Florida) Sea Monster and the Bermuda Blob are still described by some as the remains of a gigantic octopus, even though A.E. Verrill—who named the St. Augustine specimen sight unseen—recanted his identification in favor of whale remains . . . and in spite of microscopic and biochemical analyses showing that they were nothing more than the collagenous matrix of whale blubber."

In 2004, Pierce and his colleagues examined all available globster specimens using electron microscopes, and applied biochemical, molecular, and DNA analyses. The conclusion: the samples matched exactly those of various species of great whales. The DNA and molecular structure were unmistakable, and "when the microscopic anatomy and biochemical composition of the Chilean and Nantucket Blobs are compared with those of the other remains, similarities are manifest. Thus, there is no doubt that they are all derived from the same type of organism."

With the application of science, one of the world's great mysteries of the sea has finally been explained. The many mentions of globsters in books on the "unexplained" will have to be revised in the cold light of hard evidence and close scrutiny, informing their readers that a whole subgenre of "monsters" have been identified. Yet because much of the material tends toward mystery-mongering, it may take many years for the conclusions to be accepted and widely known.

Benjamin Radford is coauthor, with Joe Nickell, of Lake Monster Mysteries: Investigating the World's Most Elusive Creatures.

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Ask the Skeptic

Heard about some dubious paranormal or fringe-science claim? Ask the skeptic! Submissions can be sent to: **The Skeptical Inquiree, Skeptical Inquirer, P.O. Box 703, Amherst NY 14226 (or bradford@centerforinquiry.net).**

Magnet Therapy

A Billion-dollar Boondoggle

About a billion dollars a year is now spent on "magnet therapy," which is claimed to eliminate many symptoms and diseases. Basic scientific principles indicate that all of this money is wasted.

BRUCE L. FLAMM

Gerald Fried

About a year ago Leonard Finegold at Drexel University and I decided to look into the controversial field (no pun intended) of "magnet therapy." As a physics professor, Finegold knows a bit about magnets and magnetic fields. As a physician and former research chairman, I know a bit about therapy and medical research. Perhaps a physicist and a physician could shed some light on this interesting topic. We knew that magnets were touted as a treatment for many medical conditions and we knew that they were popular. But we were both quite surprised to learn just how popular they are. In the U.S.A., their annual sales are estimated at $300 million (Brody 2000), and globally more than a billion dollars (Weintraub 1999). You can get a rough idea of the magnitude of the magnet healing industry by doing a Google search for *magnet healing*. A search in January 2006 yielded 459,000 Web pages, many of them claiming that magnets have almost miraculous healing power. Do they? Professor Finegold and I reviewed the literature on magnet therapy and found very little supporting evidence. An abbreviated version of our review was recently published in the *British Medical Journal* (Finegold and Flamm 2006). What follows are a few comments on the magnet healing industry, a brief synopsis of our *BMJ* paper, and a look at magnet therapy from a theoretical point of view.

Magnet Therapy Is Big Business

If you try the Internet searching experiment described above you will notice that in addition to almost half a million pages dealing with magnet therapy, Google automatically provides a list of "sponsored links." Your computer screen will fill with the names of companies that have paid to help you find their site. What do these sites offer? If you click on www.magnetsandhealth.com, you will learn that "magnets help to flush out toxins in our body" and that "our magnet products have both beauty and health benefits, they increase blood flow and they increase the oxygen level in the body." Really? They also point out that their magnets are small and mobile, which "allows you to heal the ailments of yourself and your family without having major interruptions in your life and routine. You also get all the benefits without having to go for expensive sessions with a magnetic therapist or having to take expensive courses of drugs which can also have harmful side effects." The message seems quite clear: Why bother with doctors and medicines when magnets are safe and effective?

Another of the scores of sponsored links is www.magnetictherapymagnets.com. This site is interesting because, in addition to selling dozens of magnetic healing devices for humans, it doesn't forget about Fido. For only $11.95 plus shipping they will send you an amazing pet collar that will "keep your cat or dog in excellent health and vitality with constant magnetic therapy." My wife and I are now kicking ourselves for spending thousands of dollars on veterinary care over the past several years. If we had only bought that collar!

I don't mean to pick on these two companies or imply that their claims are any more outrageous than any others. In fact, there are now hundreds of companies selling similar devices and making similar claims.

Among the companies touting magnet therapy I was surprised to find the Sharper Image, a seemingly reputable outfit. They offer a device called a "Dual-Head Personal Massager with Magnetic Therapy." It is somewhat phallus-shaped, small enough to fit in a purse, and claims to be a "discreet personal massager with two independent vibrating heads." That certainly seems enticing enough, but they insist that it does far more that your average vibrator. "A smaller pinpoint node enhances its massage with magnetic therapy for focused treatment." Hmm . . . magnet therapy for focused treatment.

Some companies actually claim that their magnets prevent, reverse, and cure cancer. For example, at one site (http://azunimags.bigstep.com/item.jhtml?UCIDs=525663|1230205&PRID=1169182) purveyors of cancer-curing magnets will sell you, for only $2,595, the "Dr. Philpott Designed and Approved Polar Power Super Bed Grid." According to the site, "This is the strongest, deepest penetrating, permanent static magnet, biomagnetic therapy device available anywhere that we know of. It is used in many of Dr. Philpotts' magnetic research protocols for prevention and reversal of cancer and other serious disease that requires a full systemic deep penetrating treatment of the whole body." Similarly absurd claims can be found at www.stopcancer.com/magnets.htm.

Do the legions of magnet therapists and magnet purveyors really believe the incredible claims that they make? Are they well-meaning but misguided individuals or con artists willing to say anything to make a buck? Both types are most likely involved.

Studies on Magnet Therapy

The overall conclusion of our *BMJ* review was stated in the first sentence, "We believe there is a worldwide epidemic of useless magnet therapy" (Finegold and Flamm 2006). As you can imagine, this statement was not well-received in the magnet healing community. We found that many studies on "magnet therapy" were published in "alternative" journals as opposed to peer-reviewed medical journals. Many studies included too few patients to reach statistically significant conclusions. Others had problems with their placebo control groups. For example, study subjects realized that they were wearing a magnetic bracelet rather than a placebo bracelet when it attracted paper clips or other small metal objects. In light of the vast amounts of money spent each year on supposedly therapeutic magnets, surprisingly few legitimate randomized controlled trials have been conducted to evaluate their efficacy. An excellent critique of magnet therapy by Quackwatch founder Stephen Barrett, M.D., can be found at www.quackwatch.org/04ConsumerEducation/QA/magnet.html.

Bruce L. Flamm, M.D., is a physician and medical researcher who has a major interest in supporting science over superstition and evidence-based medicine over quackery. His ongoing investigation of the bizarre Cha/Wirth/Lobo Columbia University "Pray for Pregnancy" study (SKEPTICAL INQUIRER, September/October 2004 and March/April 2005) has been featured in Time *magazine,* The New York Times*, and dozens of other newspapers and magazines all over the world.*

Is Magnet Therapy Even Theoretically Possible?

In reality, many people find anecdotal reports of healing, particularly from athletes or other trusted celebrities, to be more convincing than scientific studies.

There are certainly many people touting magnet therapy. But is there, even theoretically, any way that magnets could have any healing effect? In our *BMJ* review we restricted our comments to typical magnetic devices claimed to have therapeutic value: these use "static" magnets like those used to attach paper notes to a refrigerator door. In this context, *static* means nonmoving and has nothing to do with static electricity. Moving magnets or pulsed electromagnets can create electric fields and electromagnetic radiation that could have some effect on living tissue. In contrast, a typical nonmoving magnet produces only a magnetic field. Is there anything in the human body that is affected by magnetic fields? Surprisingly, the answer appears to be no. This seems counterintuitive since most people know that oxygen in our blood is carried by hemoglobin and that hemoglobin contains iron. This is why iron tablets are often recommended for the treatment of anemia. However, the iron in hemoglobin is not ferromagnetic (see www.badscience.net/?p=88 and www.hfienberg.com/clips/magnet.htm). If hemoglobin contained ferromagnetic iron it would be simple to separate red blood cells from other bloods cells with a magnet. Several studies have shown that static magnetic fields do not affect blood flow (see www.hfienberg.com/clips/magnet.htm and www.quackwatch.org/01QuackeryRelatedTopics/PhonyAds/florsheim.html). Perhaps more important, if hemoglobin contained ferromagnetic iron people might explode or be flung across the room when exposed to the extraordinarily powerful magnetic field of a MRI scan. For a fascinating look at things that can go wrong when ferromagnetic materials get too close to the powerful magnetic field of an MRI machine, visit http://mripractice.tripod.com/mrpractice/id69.htm and www.simplyphysics.com/flying_objects.html.

Is there anything in the human body that is affected by magnetic fields? Surprisingly, the answer appears to be no. If hemoglobin contained ferromagnetic iron it would be simple to separate red blood cells from other bloods cells with a magnet.

However, for the sake of argument, what if some effect of magnets on human tissue could be demonstrated? What is the likelihood that it would be a therapeutic or healing effect? Probably slim to nil. By analogy, consider chemical compounds. The number of known chemical compounds is on the order of ten million. However, only a handful have ever been shown to have any therapeutic effects. Yet millions are toxic. It would be most unwise to eat or drink anything found on the shelves of a typical chemistry lab. If a magnet had an effect on human tissue, there is no reason to believe that it would necessarily be a healing effect.

Moreover, even the rare chemical compound that has healing effects usually does so only in very specific dose ranges. Almost any prescription drug can harm or kill you if you ingest enough of it. If, theoretically, a magnet had some effect on human tissue and if, astoundingly, the effect was beneficial rather than toxic, would one not expect there to be an optimal dosage? Yet, advertised healing magnets vary widely in their field strength. Many magnet purveyors claim that the more powerful the magnet, the greater the healing effect. This sounds good but makes little sense. All known effective therapies—including medications, x-rays, and lasers—become toxic or damaging at high levels. Nevertheless, the "magnet therapist" who debated me on BBC radio immediately after our paper was published chided me for not understanding that some magnet healers fail because they don't use strong enough magnets. She was so convincing that I think she actually believes this. The BBC radio host made a point of stating that the magnet therapist was "certified." By whom, I wondered? The Intergalactic Association of Magnetic and Crystal Healers? After the show my colleague Professor Finegold, who was raised in the United Kingdom, informed me that the word "certified" has a derogatory mental health connotation in the UK. Perhaps the BBC host was not flattering my opponent.

Some magnet advocates contend that no one has conclusively proven that magnets cannot heal. Of course, they have it backwards. When it comes to healing, the burden of proof is on the seller, not the buyer. One is supposed to prove that a therapy works before marketing it to the public. If this were not true, medical companies could save billions by selling all sorts of untested drugs and devices. In reality, the government insists that every medicine and therapeutic device be meticulously tested for both safety and efficacy. This protective system generally works and only rarely do unsafe or ineffective products slip through and reach the public. Sadly, it seems that no such protective laws exist for magnets, crystals, amulets, magic potions, or other claimed miracle cures.

Finally, in the firestorm of criticism that followed the publication of our *BMJ* article, a frequent complaint was that I don't have an "open" mind. It might be more fair to say that my mind is open—but not to nonsense. If properly conducted research demonstrates a genuine healing effect of static magnets, I will cheerfully incorporate magnet therapy into my clinical practice. Until that time, I hope that parents will take their sick children to evidence-based physicians rather than "certified" magnet healers.

Notes

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The Philosophy behind Pseudoscience

Every intellectual endeavor, whether authentic or bogus, has an underlying philosophy. Science, for example, involves six kinds of philosophical ideas. These differ totally from those behind pseudoscience. Evaluating a field's underlying philosophy is a revealing way to make distinctions and judge worth.

MARIO BUNGE

José López-Rega was the evil gray eminence behind General Perón in his dotage, as well as that of Perón's successor, his wife, Isabelita. He had been a failed singer, a police officer, a bodyguard, and the author of best sellers on business and the stars, love and the stars, and the like. He was a firm believer in the occult and a practicing black magician. López-Rega believed not only in astral influences and in the spirit world but also in his own ability to conjure up spirits and manipulate them. Once, he attempted to transfer the soul of the dead Juan Perón into his dim-witted successor, Isabelita. However, this task proved to be beyond his ability (see, e.g., Martínez 1989).

Most scientists, as well as most pseudoscientists, are unaware that they uphold any philosophical views. Moreover, they dislike being told that they do.

López-Rega is not known to have dabbled in philosophy. However, like everyone else, he did hold definite philosophical views. Among these were the age-old myths of the immaterial soul, the possibility of paranormal cognition, and the existence of supernatural beings. These beliefs underlie his conviction that he was able to influence other people's behavior by sheer mental power, as well as to get in touch with higher powers. In turn, these beliefs and practices gave him the self-confidence, prestige, and authority he needed to perform his sinister political maneuvers. Among other things, he organized a death squad that carried out uncounted assassinations and torture sessions of political opponents during the 1973–76 period, when he was at the peak of his political power. Thus, El Brujo ("the Wizard"), as the Minister of Public Welfare was popularly known, had the backing of millennia of philosophical myths.

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Every intellectual endeavor, whether authentic or bogus, has an underlying philosophy and, in particular, an ontology (a theory of being and becoming) and an epistemology (a theory of knowledge). For example, the philosophy behind evolutionary biology is naturalism (or materialism) together with epistemological realism, the view that the world exists on its own and can be investigated. By contrast, the philosophy behind creationism (whether traditional or "scientific") is supernaturalism (the oldest variety of idealism) together with epistemological idealism (which involves the disregard for empirical tests).

To be sure, most scientists, as well as most pseudoscientists, are unaware that they uphold any philosophical views. Moreover, they dislike being told that they do. And the most popular among the respectable philosophies of science of the day, namely the logical positivists and Popper's followers, teach that science and philosophy are mutually disjointed rather than intersecting. However, this view is false. Indeed, nobody can help but employ a great number of philosophical concepts, such as those of reality, time, causation, chance, knowledge, and truth. And once in a while, everyone ponders philosophical problems, such as those of the nature of life, mind, mathematical objects, science, society, and what is good. Moreover, the neutrality view is dangerous, because it masks the philosophical traps into which bona fide scientists may fall, and it dissuades them from explicitly using philosophical tools in their research.

Since there is no consensus about the nature of science, let alone pseudoscience, I will inquire into the philosophies that lurk behind psychoanalysis and computationist psychology.

1. Science: Authentic and Bogus

We shall be concerned only with sciences and pseudosciences that claim to deal with facts, whether natural or social. Hence, we shall not deal with mathematics except as a tool for the exploration of the real world. Obviously, this world can be explored either scientifically or nonscientifically. In either case, such exploration, like any other deliberate human activity, involves a certain approach, that is, set of general assumptions, some background knowledge of the items to be explored, a goal, and a means or method of proceeding.

In a way, the general assumptions, the extant knowledge of the facts to be explored, and the goal dictate jointly the means or method to be employed. Thus, if what is to be explored is the mind, if the latter is conceived of as an immaterial entity and the goal is to understand mental processes in any old way, then the cheapest means is to engage in free speculation. Given such idealistic assumptions about the nature of the mind, it would be preposterous to try and catch it by exploring the brain. If, on the other hand, mental processes are assumed to be brain processes and if the aim is to understand the

mechanisms underlying mental phenomena, then the scientific method, particularly in its experimental version, is mandatory. (This is the philosophical rationale of cognitive neuroscience.) That is, whether or not a scientist studies the brain in order to understand the mind depends critically upon her more or less tacit philosophy of mind.

In general, one starts research by picking a domain (D) of facts, then makes (or takes for granted) some general assumptions (G) about them, collects a body (B) of extant knowledge about the items in (D), decides on an aim (A), and in the light of the preceding, determines the proper method (M) to study (D). Hence, an arbitrary research project (p) may be sketched as the ordered quintuple p=(D, G, B, A, M). The function of this list is to keep track of the essentials in framing the following definitions.

A *scientific* investigation of a domain of facts (D) assumes that these are material, lawful, and scrutable, as opposed to immaterial (in particular supernatural), lawless, or inscrutable; and the investigation is based on a body of previous scientific findings (B), and it is done with the main aim of describing and explaining the facts in question (A) with the help of the scientific method (M). In turn, the latter may be described summarily as the sequence: choice of background knowledge; statement of problem(s); tentative solution (e.g., hypothesis or experimental technique); run of empirical tests (observations, measurements, or experiments); evaluation of test results; eventual correction of any of the preceding steps, and new problems posed by the finding.

Contrary to widespread belief, the scientific method does not exclude speculation: it only disciplines imagination. For example, it is not enough to produce an ingenious mathematical model of some domain of facts the way mathematical economists do. Consistency, sophistication, and beauty are never enough in scientific research, the end product of which is expected to match reality—i.e., to be true to some degree. Pseudoscientists are not to be blamed for exerting their imaginations but rather for letting them run loose. The place for unbridled speculation is art, not science.

The scientific method presupposes that everything can in principle be debated and that every scientific debate must be logically valid (even if no logical principles or rules are explicitly invoked). This method also involves two key semantic ideas: meaning and truth. Nonsense cannot be investigated, hence it cannot be pronounced false. (Think of calculating or measuring the time required to fly from one place to another using Heidegger's definition of time as "the maturation of temporality.") Furthermore, the scientific method cannot be practiced consistently in a moral vacuum. Indeed, it involves the ethos of basic science, which Robert K. Merton (1973) characterized as universalism, disinterestedness, organized skepticism, and epistemic communism (the sharing of methods and findings).

Finally, there are four more distinguishing features of any authentic science: changeability, compatibility with the bulk of the antecedent knowledge, partial intersection with at least one other science, and control by the scientific community. The first condition flows from the fact that there is no "live" science without research, and research is likely to enrich or correct the fund of knowledge. In sum, science is eminently changeable. By contrast, the pseudosciences and their background ideologies are either stagnant (like parapsychology) or they change under pressure from power groups or as a result of disputes among factions (as has been the case with psychoanalysis).

The second condition can be restated thus: to be worthy of the attention of a scientific community, an idea must be neither obvious nor so outlandish that it clashes with the bulk (though not the totality) of the antecedent knowledge. Compatibility with the latter is necessary, not only to weed out groundless speculation but also to understand the new idea as well as to evaluate it. Indeed, the worth of a hypothesis or of an experimental design is gauged partly by the extent to which it fits in with reasonably well-established bits of knowledge. (For example, telekinesis is called into question by the fact that it violates the principle of conservation of energy.) Typically, the principles of a pseudoscience can be learned in a few days, whereas those of a genuine science may occupy an entire lifetime, if only because of the bulky body of background knowledge they are based upon.

The third condition, that of either using or feeding other research fields, follows from the fact that the classification of the factual sciences is somewhat artificial. For example, where does the study of memory fall: in psychology, neuroscience, or both? And which discipline investigates the distribution of wealth: sociology, economics, or both? Because of such partial overlaps and interactions, the set of all the sciences constitutes a system. By contrast, the pseudosciences are typically solitary.

The fourth condition, summarized as control by the scientific community, can be spelled out this way. Investigators do not work in a social vacuum but experience the stimuli and inhibitions of fellow workers (mostly personally unknown to them). They borrow problems and findings and ask for criticisms; and, if they have anything interesting to say, they get both solicited and unsolicited opinions. Such interplay of cooperation with competition is a mechanism for the generation of problems and the control and diffusion of results; it makes scientific research a self-doubting, self-correcting, and self-perpetuating enterprise. This makes the actual attainment of truth less peculiar to science than the ability and willingness to detect error and correct it. (After all, everyday knowledge is full of well-attested trivialities that have not resulted from scientific research.)

So much for the distinguishing features of genuine factual science, whether natural, social, or biosocial. (More can be found in Gardner 1983, Wolpert 1992, Bunge 1998a, and Kurtz 2001.) By contrast, a *pseudoscientific* treatment of a domain of facts violates at least one of the above conditions, while at the same time calling itself scientific. It may be inconsistent, or it may involve unclear ideas. It may assume the reality of imaginary facts, such as alien abduction or telekinesis, self-replicating and selfish genes, or innate ideas. It may postulate that the facts in question are immaterial, inscrutable, or both. It may fail to be based on previous scientific findings. It may perform deeply flawed empirical operations, such as ink-blot tests, or it may fail to include control groups. It may fake test results, or it may dispense with empirical tests altogether.

Besides, the pseudosciences do not evolve or, if they do, their changes do not result from research. They are isolated from other disciplines, although occasionally, they interbreed with sister bogus sciences, as witnessed by psychoanalytic astrology. And, far from welcoming criticism, they attempt to fix belief. Their aim is not to search for truth but to persuade: they posit arrivals without departures and without journeys. Whereas science is full of problems, and every one of its findings poses further problems, pseudoscience is characterized by certainty. In other words, whereas science begets more science, pseudoscience is barren, because it generates no new problems. In sum, the main trouble with pseudoscience is that its research is either deeply flawed or nonexistent. This is why, contrary to scientific research, pseudoscientific speculation has not delivered a single law of nature or of society.

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So much for a sketchy characterization of both authentic and bogus science. Let us now apply our analysis to a couple of interesting recent cases: physical chemistry and neuropsychology.

2. Two Cases: Self-organization and the Unconscious

Our first example is the treatment of self-organizing systems: complex wholes that get self-assembled in the absence of external forces. Self-organization, in particular, biological morphogenesis, is a wondrous but poorly understood process. No wonder that it has been the object of much pseudoscientific speculation peppered with high-sounding but empty expressions, such as "constructive force," "entelechy," "élan vital," "morphogenetic field," "autopoiesis," and the like. All such factors have often been regarded as being immaterial, hence beyond the reach of physics and chemistry. And they are neither described in any detail nor manipulated in the laboratory. Hence, talk of such factors is just hand waving, when not magic-wand waving.

By contrast, the scientific approach to self-organization is down-to-earth yet imaginative. Let us peek at a recent instance of this approach: the work of Adams, Dogic, Keller, and Fraden (1998). Colloids consisting of tiny rods and spheres were randomly suspended in a buffer sealed in glass capillaries, then left to their own devices and observed under a microscope. The rods were viruses, and the spheres plastic balls; the former were negatively charged, and the latter positively charged. After some time, the mixture separated spontaneously into two or more homogeneous phases. Depending on the experimental conditions, a phase may consist of layers of rods alternating with layers of spheres, or the spheres may assemble into columns.

Paradoxically, these various types of demixing are explained in terms of repulsions between the charged particles—which, intuitively, should preclude the crowding of particles with the same charge. And the equally paradoxical decrease in entropy (order increase) is explained by noting that the clumping of some of the colloids is accompanied by a raise in the translational entropy of the medium. In any event, the whole process is accounted for in strictly naturalistic terms. At the same time, the authors warn that their results are at variance with the pertinent theory—though of course not with any general physical systems. Such incompleteness is typical of factual science, by contrast to pseudoscience, where everything is cut and dried from the start.

Our second example is the study of the unconscious. Much has been written about it, most of it in a speculative vein, ever since Socrates claimed that, by clever questioning, he was able to ferret out tacit mathematical knowledge from an illiterate slave boy. Thanks to Eduard von Hartmann's best seller, *Die Philosophie des Unbewussten* (1870), the subject was already popular in 1900, when Freud first proposed his wild fantasies. Among other things, Freud reified the unconscious and attributed to it causal powers that allegedly accounted for a number of unexplained phenomena, such as slips of the tongue and the mythical Oedipus complex. But of course, it never occurred to him or to any of his followers to approach this subject in an experimental manner.

The scientific study of unconscious mental processes began a couple of decades ago with observations on split-brain and blindsight patients. Since then, the various brain-imaging techniques, such as PET scanning and functional MRI, have made it possible to ascertain whether someone feels or knows something even though he or she does not know that he feels or knows it. Moreover, these techniques make it possible to localize such mental processes in a noninvasive way. An example is the paper by Morris, Öhman, and Dolan (1998)—which, unsurprisingly, does not cite any psychoanalytic studies. Let us look at it.

The amygdala is the tiny brain organ that feels such basic and ancient emotions as fear and anger. If damaged, a person's emotional and social life will be severely stunted. The activity of the amygdala can be monitored by a PET scanner; this device allows the experimenter to detect a subject's emotions, and even to locate them in either side of the amygdala.

However, such neural activity may not reach the conscious level. In this case, only a brain scanner can help.

For example, if a normal human subject is briefly shown an angry face as a target stimulus, and immediately thereafter an expressionless mask, he will report seeing the latter but not the former. Yet, the scanner tells a different story. It tells us that, if the angry face has been associated with an aversive stimulus, such as a burst of high-intensity white noise, the amygdala is activated by the target, even though the subject does not recall having seen it. In short, the amygdala "knows" something that the organ of consciousness (whichever and wherever it is) does not. Psychoanalysts could use this very method to measure the intensity of a male's hatred for his father. But they don't, because they don't believe in the brain: their psychology is idealistic, hence brainless. More on this in section 4.

The number of examples of pseudoscience can be multiplied at will. Astrology, alchemy, parapsychology, characterology, graphology, creation "science," "intelligent design," Christian "Science," dowsing, homeopathy, and memetics are generally regarded as pseudoscientific (see, e.g., Kurtz 1985, Randi 1982, and THE SKEPTICAL INQUIRER). On the other hand, it is less widely accepted that psychoanalysis and computationist psychology are also bogus sciences. This is why we shall examine them in section 3. But first, we must take a brief explicit look at philosophy, for some of it is bogus.

3. Philosophy: Proscientific and Antiscientific

The above characterization of scientific research involves philosophical ideas of six kinds: logical, semantical, ontological, epistemological (in particular, methodological), ethical, and sociological. More specifically, it involves the notions of logical consequence and logical consistency; the semantic notions of meaning and truth; the ontological concepts of real fact and law (objective pattern); the epistemological concepts of knowledge and test; the principles of intellectual honesty; and the notion of a scientific community.

Why is this so? Because scientific research is, in a nutshell, the *honest* search for *true knowledge* about the *real world*, particularly its *laws*, with the help of both *theoretical* and *empirical* means—in particular the *scientific method*—and because every body of *scientific knowledge* is expected to be *logically consistent* and the subject of *rational discussion* in the bosom of a community of investigators. All the expressions in italics occur in (metascientific) discourses about any factual (empirical) science. And the discipline in charge of elucidating and systematizing the corresponding concepts is philosophy. Indeed, philosophy is the study of the most fundamental and transdisciplinary concepts and principles. Hence, philosophers are expected to be generalists rather than specialists. And some of us often assume the ungrateful task of passing judgment on the credentials of some pseudoscientific or ideological beliefs.

Now, different philosophical schools treat the above philosophical components of science differently or not at all. Recall briefly only four contemporary examples: existentialism, logical positivism, Popperianism, and Marxism.

Existentialism rejects logic and, in general, rationality; it espouses an extremely sketchy, nearly unintelligible, and even ridiculous ontology; and it has no use for semantics, epistemology, or ethics. No wonder that it has had no impact on science—except indirectly, and negatively, through its debasement of reason and support of Nazism. No wonder, too, that it has not produced an intelligible philosophy of science, let alone a stimulating one.

By contrast, logical positivism defends logic and the scientific method; but it has no defensible semantics; it has no ontology beyond phenomenalism ("there are only appearances"); its epistemology overrates induction and misunderstands or underrates scientific theory, which it regards as a mere data abstract; and it has no ethics beyond Hume's emotivism. Unsurprisingly, logical positivism misinterprets relativistic and quantum physics in terms of laboratory operations instead of as representing objectively existing physical entities that exist in the absence of observers (see, e.g., Bunge 1973). Still, logical positivism is *scientistic*, and therefore far superior to the antiscience characteristic of postmodernism.

Popperianism praises logic but rejects the very attempt to do semantics; it possesses no ontology beyond individualism (or atomism, or nominalism); it values theory to the point of regarding experiment as only a way of testing hypotheses; it overrates criticism, underrates induction, and has no use for positive evidence; and it has no ethics beyond the Buddha's and Epicurus's and Hippocrates's injunction to do no harm. However, Popperianism has the merits of having defended a realist interpretation of physical theories and of having deflated inductivism. But Popper first underrated, and later accepted but misinterpreted, evolutionary biology as consisting exclusively of culling misfits; he opposed the psychoneural monism inherent in biological psychology; he rejected the materialist conception of history adopted by the most advanced historiographic school—that of the *Annales*; and he defended neoclassical microeconomics, which—as I will argue below—is pseudoscientific in being conceptually fuzzy and immune to empirical falsification.

As for Marxism, it has introduced some revolutionary ideas in social science, particularly the materialist conception of history and the centrality of social conflict. However, Marxian materialism is narrowly economicist: it underrates the roles of politics and culture (in particular, ideology). Moreover, Marxism, following Hegel, confuses logic with ontology. Hence, it is diffident of formal logic; its materialist ontology is marred by the romantic obscurities of dialectics, such as the principle of the unity of opposites; its epistemology is naïve realism (the "reflection theory of knowledge"), which makes no room for the symbolic nature of pure mathematics and theoretical physics; it glorifies social wholes at the expense of individuals and their legitimate aspirations; it exaggerates the impact of society on cognition; and it adopts the ethics of utilitarianism, which has no use for disinterested inquiry, let alone altruism. No wonder that, when in power, dialectical materialist philosophers have opposed some of the most revolutionary scientific developments of their time: mathematical logic, relativity theory, quantum mechanics, genetics, the synthetic theory of evolution, and post-Pavlovian neuropsychology.

In short, none of these four schools matches the philosophy inherent in science. I submit that any philosophy capable of understanding and promoting scientific research has the following characteristics (Bunge 1974–1989):

Logical: Internal consistency and abidance by the rules of deductive inference; acceptance of analogy and induction as heuristic means, but no claim to *a priori* validations of analogical or inductive arguments.

Semantical: A realist theory of meaning as intended reference (denotation)—and as different from extension—together with sense or connotation. And a realist view of factual truth as the matching of a proposition with the facts it refers to.

Ontological: *Materialism* (naturalism)—all real things are material (possess energy), and they all fit some laws (causal, probabilistic, or mixed). Mental processes are brain processes, and ideas in themselves, however true or useful, are fictions. *Dynamicism*—all material things are in flux. *Systemism*—every thing is either a system or a (potential or actual) component of a system. *Emergentism*—every system has (systemic or emergent) properties that its components lack.

Epistemological: *Scientific realism*—it is possible to get to know reality, at least partially and gradually, and scientific theories are expected to represent, however imperfectly, parts or features of the real world. *Moderate skepticism*—scientific knowledge is both fallible and perfectible. However, some findings—e.g., that there are atoms and fields, that there are no disembodied ideas, and that science pays—are firm acquisitions. *Moderate empiricism*—all factual hypotheses must be empirically testable, and both positive and negative evidence are valuable indicators of truth value. *Moderate rationalism*—knowledge advances through educated guessing and reasoning combined with experience. *Scientism*—whatever is knowable and worth knowing is best known scientifically.

Ethical: *Secular humanism*—the supreme moral norm is "Pursue the welfare (biological, mental, and social) of oneself and others." This maxim directs that scientific research should satisfy either curiosity or need and abstain from doing unjustifiable harm.

Sociological: *Epistemic socialism*—scientific work, however artisanal, is social, in that it is now stimulated, now inhibited, by fellow workers and by the ruling social order, and the (provisional) umpire is not some institutional authority but the community of experts. Every such community prospers with the achievements of its members, and it facilitates the detection and correction of error. (Warning: this is a far cry from both the Marxist claim that ideas are exuded and killed by society and the constructivist-relativist view that "scientific facts" are local social constructions, that is, mere community-bound or tribal conventions.)

I submit that the above philosophical principles are tacitly met by the mature or "hard" sciences (physics, chemistry, and biology); that the immature or "soft" sciences (psychology and the social sciences) satisfy some of them; and that the pseudosciences violate most of them. In short, I submit that scientificity is coextensive with sound philosophy.

Moreover, the reason the pseudosciences are akin to religion, to the point that some of them serve as surrogates for it, is that they share a philosophy, namely philosophical idealism—not to be mistaken for moral idealism. Indeed, pseudoscience and religion postulate immaterial entities, paranormal cognitive abilities, and a heteronomous ethics. I will spell this out.

Every religion has a philosophical kernel, and the philosophies inherent in the various religions share the following idealist principles: *Idealist ontology*—there are autonomous spiritual entities, such as souls and deities, and they satisfy no scientific laws. *Idealist epistemology*—some people possess cognitive abilities that fall outside the purview of experimental psychology: divine inspiration, inborn insight, or the capacity to sense spiritual beings or prophesy events without the help of science. *Heteronomous ethics*—all people are subject to inscrutable and unbendable superhuman powers, and they are not obliged to justify their beliefs by means of scientific experiment.

All three philosophical components common to both religion and pseudoscience are at variance with the philosophy inherent in science. Hence, the theses that science is one more ideology and that science cannot conflict with religion because they address different problems in different but mutually compatible ways are false. (More on religion in science in Mahner and Bunge 1996.)

4. The Cases of Psychoanalysis and Computationist Psychology

Do psychoanalysis and computationist psychology share the philosophical features that, according to section 3, characterize the mature sciences?

Psychoanalysis violates the ontology and the methodology of all genuine science. Indeed, it holds that the soul ("mind" in the standard English translation of Freud's works) is immaterial, yet can act upon the body, as shown by psychosomatic effects. However, psychoanalysis does not assume any mechanisms whereby an immaterial entity can alter the state of a material one: it just states that this is the case. Moreover, this statement is dogmatic, since psychoanalysts, unlike psychologists, do not perform any empirical tests. In particular, no laboratory has ever been set up by any psychoanalysts. Freud himself had emphatically dissociated psychoanalysis from both experimental psychology and neuroscience.

To mark the first centenary of the publication of Freud's *Interpretation of Dreams*, the *International Journal of Psychoanalysis* published a paper by six New York analysts (Vaughan et al. 2000) who purported to report on the first experimental test ever of psychoanalysis in the course of one century. Actually, this was no experiment at all, since it involved no control group. Hence, those authors had no right to conclude that the observed improvements were due to the treatment; they could just as well have been spontaneous. Thus, psychoanalysts make no use of the scientific method, because they do not know what this is. After all, they were not trained as scientists but only, at best, as medical practitioners.

The French psychoanalyst Jacques Lacan—a hero of postmodernism—admitted this and held that psychoanalysis, far

from being a science, is a purely rhetorical practice: "*l'art du bavardage*." Finally, since psychoanalysts claim that their views are both true and effective without having submitted them to either experimental tests or rigorous clinical trials, they can hardly be said to proceed with the intellectual honesty that scientists are expected to abide by (even if they occasionally lapse). In sum, pychoanalysis does not qualify as a science. Contrary to widespread belief, it is not even a failed science, if only because it makes no use of the scientific method and ignores counterexamples. It is just quack psychology.

Computationist psychology claims that the mind is a set of computer programs that can in principle be implemented in either brains or machines—or perhaps even ghosts. That is, this popular school adopts the functionalist view that matter does not matter—that only function does. This view is encouraged by the idealist ontologies, whereas science investigates only concrete things on various levels: physical, chemical, living—thinking and nonthinking—or social. Moreover, the computationists beg the question whether certain mental processes are computations. They have no evidence that all mental processes are computational; they just assert this thesis.

But this thesis is false, since neither emotional nor creative processes are algorithmic, and only a fraction of cognitive processes are. For example, there can be no algorithms for acting spontaneously, asking original problems, formulating original hypotheses, forming fruitful analogies, or designing original artifacts, such as radically new algorithms, machines, or social organizations. Indeed, every algorithm is a procedure for performing operations of a specified kind, such as sorting, adding, and computing values of a mathematical function. By contrast, original scientific findings are not specifiable in advance—this being why research is necessary.

In sum, computationist psychology is nonscientific because it ignores negative evidence and it disregards the *matter* of mind—the brain that does the minding. Consequently, it isolates itself from neuroscience and social science—and disciplinary isolation is a reliable indicator of non-scientificity. The secret of its popularity lies not in its findings but in the computer's popularity, in that it does not demand any knowledge of neuroscience, and in the illusion that sentences of the form "X computes Y" explain, while in fact they only conceal our ignorance of the neural mechanisms. (Remember that there is no genuine explanation without mechanism, and that all mechanisms are material; see Bunge 2006.)

So much for a sample of pseudoscience. The subject of its underlying philosophy is intriguing and vast, yet largely unexplored (see, however, Flew 1987). Just think of the many pockets of pseudoscience ensconced in the sciences, such as the anthropic principle, the attempt to craft a theory of everything, information talk in biochemistry, the "it's-all-in-the-genes" dogma in biology, human sociobiology, West Coast (purely speculative) evolutionary psychology, and game-theoretic models in economics and political science. Analyze an egregious error in science, and you are likely to find a philosophical bug.

5. Borderline Cases: Proto- and Semi-

Every attempt at classifying any collection of items outside mathematics is likely to meet borderline cases. The main reasons for such vagueness are either that the classification criteria themselves are imprecise or that the item in question possesses only some of the features necessary to place it in the box in question. Remember the case of the platypus, the egg-laying mammal.

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Whatever the reason, in the case of science we find plenty of disciplines, theories, or procedures that, far from falling clearly either in the range of the scientific or outside it, may be characterized as proto-scientific, semi-scientific, or as failed science. Let us take a quick look at these cases.

A *proto-science*, or emerging science, is obviously a science *in statu nascendi*. If it survives at all, such a field may eventually develop either into a mature science, a semi-science, or a pseudoscience. In other words, when a discipline is said to be a proto-science, it is too early to pronounce it scientific or nonscientific. Examples: physics before Galileo and Huygens, chemistry before Lavoisier, and medicine before Virchov and Bernard. All of these disciplines matured quickly to become fully scientific. (Medicine and engineering can be called scientific even though they are technologies rather than sciences.)

A *semi-science* is a discipline that started out as a science, is usually called a science, yet does not fully qualify as such. I submit that cosmology, psychology, and economics are semi-sciences. Indeed, cosmology is still rife with speculations that contradict solid principles of physics. There are still psychologists who deny that the mind is what the brain does, or who write about neural systems "subserving" or "mediating" mental functions. And of course, many of the so-called Nobel Prizes in economics (which are actually prizes of the Bank of

Sweden) are awarded to inventors of mathematical models that have no resemblance to economic reality—if only because they ignore production and politics—or to designers of economic policies that harm the poor. The game-theoretic models proposed by Thomas C. Schelling, which won a Nobel Prize in 2005, are a case in point. One of them designed the strategic bombing of the Vietnamese civilian population. The same game theorist also discovered that African Americans segregate themselves: they "feel more comfortable among their own color" (Schelling 1978, 138–139).

In some cases, it is hard to know whether something is scientific, semi-scientific, or pseudoscientific. For instance, the vast majority of nineteenth-century physicists regarded atomism as a pseudoscience, because it had produced only indirect evidence for the atomic hypothesis. Worse, since there was no detailed theory of individual atoms, atomism was only weakly testable, namely through the predictions of statistical mechanics. But the theory became scientifically respectable almost overnight as a consequence of Einstein's theory of Brownian motion and Perrin's experimental confirmation of it. Only diehard positivists, like Ernst Mach, opposed atomism to the last.

Another example: quantum theory is undoubtedly a paradigm of successful high-level science. But the Copenhagen interpretation of this theory is pseudoscientific, because it places the observer at the center of the universe, since it assumes that every physical event results from a laboratory procedure. That this thesis is blatantly false is shown by the facts that the theory holds for stars, which are of course uninhabitable, and that it contains no postulates describing any observers. (More on this in Bunge 1973, Mahner 2001.)

String theory is a suspicious character. It looks scientific because it tackles an open problem that is both important and difficult, that of constructing a quantum theory of gravitation. For this reason, and because it has stimulated mathematics, it is attracting some of the brightest young brains. But the theory postulates that physical space has six or seven dimensions rather than three, just to secure mathematical consistency. Since these extra dimensions are unobservable, and since the theory has resisted experimental confirmation for more than three decades, it looks like science fiction, or at least, failed science.

The case of phrenology, the "science of skull bumps," is instructive. It proposed a testable, materialistic hypothesis, namely that all mental functions are precisely localizable brain functions. But instead of putting this exciting hypothesis to the experimental test, the phrenologists sold it successfully at fairs and other places of entertainment: They went around palpating people's skulls and claiming to locate alleged centers of altruism, philoprogenitivity, imagination, and so on. The emergence of modern neuroscience finished phrenology.

The discrediting of phrenology cast doubt not only on radical localizationism but also on the scientific attempts to map the mind onto the brain. In particular, the brain-imaging devices invented over the past three decades were first greeted with skepticism because the very attempt to localize mental processes sounded like phrenology. But these new tools have proved very fruitful and, far from confirming the phrenological hypothesis (one module per function), it has given rise to many new insights, among them, the view that all the subsystems of the brain are interconnected. If a tool or a theory leads to important findings, it cannot be pseudoscientific, because one of the marks of pseudoscience is that it is built around an old superstition.

Finally, a word of caution. Most of us are suspicious of radically new theories or tools, and this is the case for either of two reasons: because of intellectual inertia or because it is necessary to grill every newcomer to make sure that it is not an impostor. But one must try to avoid confusing the two reasons. Inquisitive types like novelty, but only as long as it does not threaten to dismantle the entire system of knowledge.

6. Pseudoscience and Politics

Pseudoscience is always dangerous, because it pollutes culture and, when it concerns health, the economy, or the polity, it puts life, liberty, or peace at risk. But of course, pseudoscience is supremely dangerous when it enjoys the support of a government, an organized religion, or large corporations. A handful of examples should suffice to make this point.

Eugenics, once promoted by many bona fide scientists and progressive public intellectuals, was invoked by American legislators to introduce and pass bills that restricted the immigration of people of "inferior races" and led to the institutionalization of thousands of children regarded as mentally feeble. The racial policies of the Nazis were justified by the same "science" and led to the murder or enslavement of millions of Jews, Slavs, and Gypsies.

The replacement of genetics with the loopy ideas of the agronomist Trophim Lysenko, who enjoyed Stalin's protection, was responsible for the spectacular backwardness of Soviet agriculture, which in turn, led to severe food shortages. The same dictatorship replaced sociology with Marxism-Leninism, whose faithful rightly indicted the social flaws of the capitalist societies but neglected the study of equally acute social issues in the Soviet empire. The consequence was that these issues got worse, and no Soviet social analyst foresaw the sudden collapse of the empire.

More recent cases of the pseudoscience-politics connection are the issues of climate change, stem-cell research, "intelligent design," and wildlife protection on the part of the present U.S. government. Such interferences are bound to have negative impacts on science, medicine, and the environment. The latest case of government support of pseudoscience is the decision of the French health minister to remove from the official Web site a report that cognitive-behavioral therapy is more effective than psychoanalysis (French psychoflap 2005).

Conclusion

Pseudoscience is just as philosophically loaded as science. Only, the philosophy inherent in either is perpendicular to that ensconced in the other. In particular, the ontology of science is naturalistic (or materialist), whereas that of pseudoscience is idealistic. The epistemology of science is realist,

whereas that of pseudoscience is not. And the ethics of science is so demanding that it does not tolerate the self-deceptions and frauds that plague pseudoscience. In sum, science is compatible with the proscience philosophy sketched in section 2, whereas pseudoscience is not.

"So what?" the reader may ask. What is the point of the above exercise in border patrolling? Answer: it may help as a warning that a research project inspired by a wrong philosophy is likely to fail. After all, this is all we can do when evaluating a research proposal before the data are in: to check whether the project is trivial or worse, namely, contrary to the "spirit" of science, so that it may deserve the infamous Ig Nobel Prize (Bunge 2004). Much the same holds, *a fortiori*, for the evaluation of ongoing research. For example, present-day particle physics is brimming with mathematically sophisticated theories that postulate the existence of weird entities that do not interact appreciably, or at all, with ordinary matter, as a consequence of which they are safely undetectable. (Some of these theories even postulate that space-time has ten or eleven dimensions instead of the four real ones.) Since these theories are at variance with the bulk of physics, and violate the requirement of empirical testability, they may qualify as pseudoscientific even if they have been around for a quarter of a century and get published in the most reputable physics journals.

Second example: all economics and management students are required to study neoclassical microeconomics. However, they are unlikely to use this theory in tackling any real-life economic problems. The reason for such uselessness is that some of the theory's postulates are wildly unrealistic and others excessively fuzzy, hence hardly testable. Indeed, the theory assumes that all the actors in a market are free, mutually independent, perfectly well-informed, equally powerful, immune to politics, and fully "rational"—i.e., capable of choosing the options likely to maximize their expected utilities. But real markets are peopled by individuals and firms who have imperfect information and, far from being totally free, belong to social networks or even monopolies. Moreover, the expected utility in question is ill-defined, being the product of two quantities that are estimated subjectively rather than on the strength of hard data, namely the probability of the event in question and the corresponding utility to the agent. (Most of the time, the precise form of the utility function is not specified. And, when specified, the choice is not justified empirically.) Milton Friedman (1991) boasted that, in its present form, this theory is just "old wine in new bottles." In my view, the fact that the theory has remained essentially untouched for over a century despite significant progress in other branches of social science is a clear indicator that it is pseudoscientific. (More in Bunge 1998b.)

The moral: before jumping headlong into a research project, check it for unsound philosophical presuppositions, such as the beliefs that mathematical sophistication suffices in factual science, that playing with undefined symbols can make up for conceptual fuzziness or lack of empirical support, or that there can be smiles (or thoughts) without heads.

In short, tell me what philosophy you use (not just profess), and I'll tell you what your science is worth. And tell me what science you use (not just pay lip service to), and I'll tell you what your philosophy is worth.

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Why Quantum Mechanics Is Not So Weird after All

Richard Feynman's "least-action" approach to quantum physics in effect shows that it is just classical physics constrained by a simple mechanism. When the complicated mathematics is left aside, valuable insights are gained.

PAUL QUINCEY

The birth of quantum mechanics can be dated to 1925, when physicists such as Werner Heisenberg and Erwin Schrödinger invented mathematical procedures that accurately replicated many of the observed properties of atoms. The change from earlier types of physics was dramatic, and pre-quantum physics was soon called classical physics in a kind of nostalgia for the days when waves were waves, particles were particles, and everything knew its place in the world.

Since 1925, quantum mechanics has never looked back. It soon became clear that the new methods were not just good at accounting for the properties of atoms, they were absolutely central to explaining why atoms did not collapse,

how solids can be rigid, and how different atoms combine together in what we call chemistry and biology. The rules of classical physics, far from being a reliable description of the everyday world that breaks down at the scale of the atom, turned out to be incapable of explaining anything much more complicated than how planets orbit the sun, unless they used either the results of quantum mechanics or a lot of ad hoc assumptions.

But this triumph of quantum mechanics came with an unexpected problem—when you stepped outside of the mathematics and tried to explain what was going on, it didn't seem to make any sense. Elementary particles such as electrons behave like waves, apparently moving like ripples on a pond; they also seem to be instantaneously aware of distant objects and to be in different places at the same time. It seemed that any weird idea could gain respectability by finding similarities with some of the weird features of quantum mechanics. It has become almost obligatory to declare that quantum physics, in contrast to classical physics, cannot be understood, and that we should admire its ability to give the right answers without thinking about it too hard.

And yet, eighty years and unprecedented numbers of physicists later, naked quantum weirdness remains elusive. There are plenty of quantum phenomena, from the magnetism of iron and the superconductivity of lead to lasers and electronics, but none of them really qualifies as truly bizarre in the way we might expect. The greatest mystery of quantum mechanics is how its ideas have remained so weird while it explained more and more about the world around us.

Perhaps it is time to revisit the ideas with the benefit of hindsight, to see if either quantum mechanics is less weird than we usually think it is or the world around us is more so.

Classical Mechanics in Action

When we think of planets orbiting the sun, we usually adopt Newton's view that they are constantly accelerating—in this case changing direction—in response to gravitational forces. From this, we can calculate the motions precisely, and the impressive accuracy of predictions for total solar eclipses shows how well it works.

There is, however, another way of thinking about what is happening that gives exactly the same results. Instead of the Principle of Acceleration by Forces, as we might call it, there is an alternative called the Principle of Least Action, or more correctly, Hamilton's Principle.

It is a principle that was first put forward about fifty years after Newton's, in its earliest form by the Frenchman Pierre Maupertuis, and in its ultimate form by the Irishman William Rowan Hamilton.

The general idea is that when a planet travels through space, or a ball travels through the air, the path that is followed is the one that minimizes something called the *action* between the start and end points. Action, for our purposes here, is just something that can be measured out for some particular object moving along a particular path. It is exactly defined and is measured in units of energy multiplied by time. The details are not important unless you need to make calculations.

We therefore have two quite different ways of describing situations in classical physics that are equally good in terms of giving the right answer. To give the simplest possible example, we can think of a golf ball travelling across an idealized, frictionless, flat green. In Newton's view (figure 1), the ball moves in a straight line at constant speed, because that is what Newton's Law says it must do. In Maupertuis' view (figure 2), the ball does this because this path is the one that has the least action between the start and end points. This trivial example can be made more interesting by making the green have humps and dips, which are like having forces acting on the ball, but the principles stay the same.

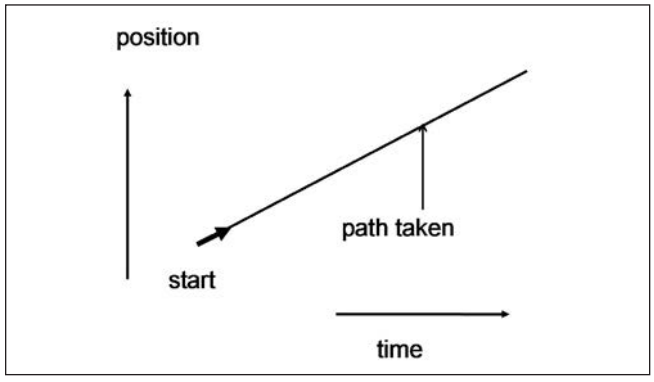

Figure 1: Classical mechanics—Newton's view: the ball moves in a straight line at a constant speed, because that is what things do when there are no forces acting on them.

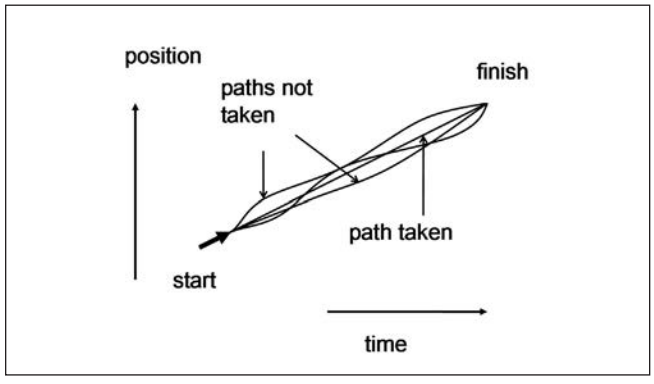

Figure 2: Classical mechanics—Maupertuis' view: the ball moves in a straight line at a constant speed to any given point on its travels, because that is the path of least action between the start and finish.

Hamilton's Principle is fundamentally equivalent to Newton's Laws, and comes into its own when solving more advanced types of classical problems. But as an explanation, it has a major flaw—it seems to mean that things need to know where they are going before they work out how to get there.

Actually, this is where classical mechanics makes its first big step toward quantum mechanics, if only we look at it another way. The mathematics of Hamilton's Principle can be described in words alternatively like this: given its starting

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points and motion, an object will end up at locations that are connected to its starting point by a path whose action is a minimum compared to neighboring paths. If locations away from the classical path are considered, no such paths exist—there will always be a path with the *least* action, but this is not a *minimum*.

It is an unfamiliar idea, but well worth a little effort to try and digest. One vital change to note is that, while still being classical physics, the emphasis has moved away from knowing the path that is followed to having a test to check whether possible destinations are on the right track. And the crucial factor is being able to compare the actions of different paths.

It leads to a third picture for our moving golf ball, central to the later move to quantum physics, which we can call Feynman's view of classical physics (figure 3).

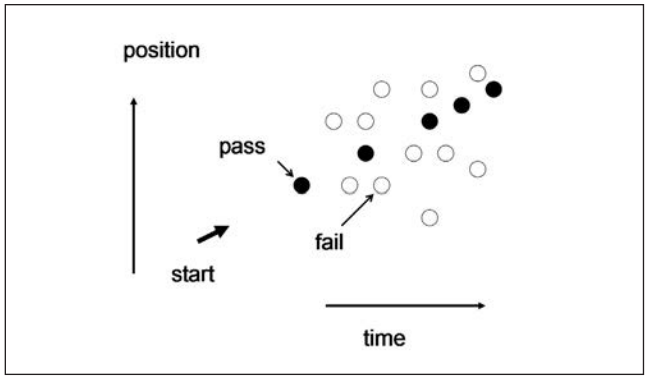

Figure 3: Classical mechanics—Feynman's view: the ball is found at the black points, which happen to lie on a straight line, and not the white points, because only the black points pass the "action test." This means that there is a path from the start to the black points whose action is a minimum compared to neighboring paths, but there is no such path from the start to the white spots.

If we stay within the world of classical physics, we can choose to ignore this strange new description and stick with the more comfortable idea that things are accelerated along paths by forces, but this would be a personal preference rather than a rational one. The new view prompts the question: "How do things work out whether possible destinations are linked to the start by a path of minimal action?" We should appreciate, however, that the old Newtonian view prompts equally difficult questions like: "How do things respond to forces by accelerating just the required amount, instant by instant?" Moreover, as we will see, the action version is the one that the world around us seems to use.

Roll on, Quantum Mechanics

Suppose we take the action question seriously and give it a rather simple answer: Nature has to check out all possible destinations to see if they are on the right track. It must do this by trying to find out if there is a path of minimal action to each destination. It uses a device that can measure the action along all possible paths to each destination.

The device is a simple surveyor's wheel for measuring action—just a wheel with a mark on the rim (figure 4). There isn't literally a type of wheel that measures action, but we can imagine that there is. The mechanism assigns probabilities to each destination according to whether, with just this simple measuring tool, it can find a path of minimal action.

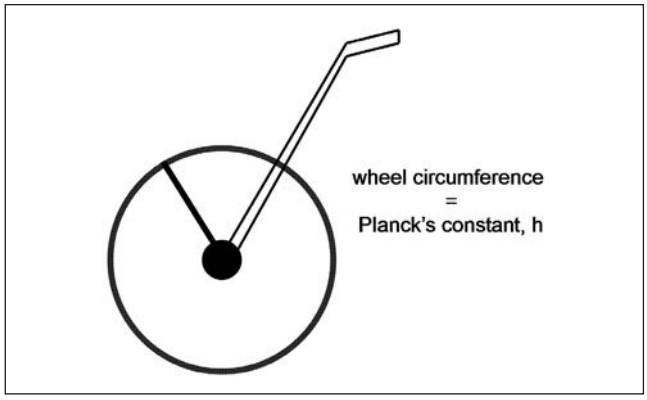

Figure 4: The single most potent image of quantum mechanics—a surveyor's wheel for measuring action

When the actions it is trying to measure are large compared to the size of the wheel, the system typically works just as classical physics requires. But in some situations the mechanism fails to produce classical mechanics and gives us quantum mechanics instead. We call the circumference of the wheel "Planck's constant," after Max Planck, who discovered its importance by an indirect route in 1900.

You may be wondering how exactly the wheel can tell us what we need to know, but we don't need to go into the details here—those interested should read Richard Feynman's book, *QED: The Strange Theory of Light and Matter*, or see the summary given in the box on page 43.

Differences from Classical Physics

As we might expect, the introduction of a mechanism for carrying out classical mechanics only makes a difference when the mechanism can't do its job properly. Specifically, if we want to check out destinations that are too close to the start, as gauged by the size of the wheel, the mechanism doesn't work. It cannot say where the object should be going, and there is an intrinsic fuzziness associated with it, with a scale set by the amount of action known as Planck's constant. This is otherwise known as the Uncertainty Principle.

A second feature arises from the simple circular nature of the measuring device. It cannot tell the difference between paths that differ by an amount of action that is an exact whole number of Planck's constants. This can lead to patterns of probabilities that look just like classical waves, because the mathematics of waves is very similar to the mathematics of circular motion.

The most important change comes when we consider objects in very small orbits, like electrons around nuclei. The mechanism gives zero probability unless the orbit (or more correctly the state) has an action that is an exact multiple of Planck's constant. This crude mechanism explains why atoms can only shrink to a certain point, to a state with an action of Planck's constant, where they become stable.

With one extra idea, which we will mention later, the mechanism seems to explain the workings of chemistry,

biology, and all the other successes of quantum mechanics, without ever really stopping being classical mechanics.

Three Conceptual Problems with Quantum Mechanics

The way it is normally introduced, quantum mechanics is something quite baffling, and certainly stranger than just classical mechanics with a mechanism. It is worth addressing the three most obvious difficulties directly:

1) *Quantum mechanics gives answers that are a set of probabilities all existing at the same time. This is totally unreal.* As Schrödinger pointed out, quantum mechanics seems to say that you could create a situation where a cat was both alive and dead at the same time, and we never see this. But this is in fact a very curious piece of ammunition to use against quantum mechanics.

We already have a very good nontechnical word for a mixture of possibilities coexisting at the same time—we call it the future. Unless we believe that all events are predetermined, which would be a very dismal view of the world, this is what the future must be like. Of course, we never experience it until it becomes the present, when only one of the possibilities takes place, but the actual future—as opposed to our prediction of one version of it—must be something much like what quantum mechanics describes. This is a great triumph for quantum mechanics over classical mechanics, which by describing all events as inevitable, effectively deprived us of a future.

Of course, there is now a new big question of how one of the possibilities in the future is selected to form what we see as the present and what becomes the past, but we should not see the lack of a ready answer as a fault of quantum mechanics. This is a question that is large enough, encompassing such ideas as fate and free will, to be set aside for another time. The headline "Physics Cannot Predict the Future in Detail" should be no great embarrassment.

2) Quantum mechanics means that there is a kind of instant awareness between everything. This is quite true, but by introducing quantum mechanics in the way that we have, the "awareness" is of a very limited kind—limited to the awareness gained through the action-measuring mechanism as it checks all possible destinations. It is very hard to see how the only result of this—a probability associated with each destination—could be used to send a signal faster than light or violate any other cherished principle. It is rather revealing that one of the few novel quantum phenomena is a means of cryptography—a way of concealing a signal rather than sending one.

3) Quantum mechanics doesn't allow us to say where everything is, every instant of the time. This is the most interesting "fault" of quantum mechanics, and it can be expressed in many ways: particles need to be in more than one place at a time; their positions are not defined until they are "observed"; they behave like waves. We will summarize this as an inability to say exactly where particles are all the time.

The "classic" illustration of this is the experiment of passing a steady stream of electrons through two slits (figure 5). Instead of the simple shadows we would expect if the particles were just particles, we see an interference pattern, as if the electrons have dematerialized into a wave and passed through both slits at the same time.

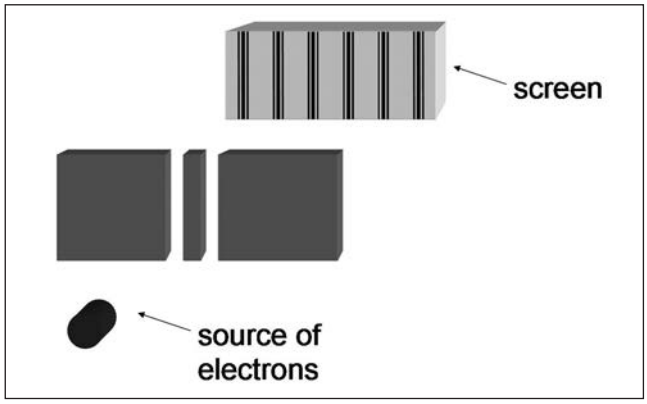

Figure 5: A schematic diagram of the two-slits experiment

There are several ways of coming to terms with this. The first thing to note is that the lack of complete information is not really a problem that arose in quantum mechanics—it originates in the third version of classical mechanics. In the Feynman version, the essence of motion is a process of determining if a destination is on or off the right track. Before the move to quantum mechanics, we can do this as often as we like, so that we can fill in the gaps as closely as we like, but the precedent has been set: physics is about testing discrete locations rather than calculating continuous trajectories. If it is inherent in old-fashioned classical physics, not just "weird" quantum physics, perhaps we can relax a little.

The second point is to clarify what the problem is. To take the two-slit example, we never see electrons dematerialize, or rippling through something, we just find it necessary to think that they do to explain the pattern that we see on the screen. If we deliberately try to observe where the electrons go, we see them as particles somewhere else, but the interference pattern disappears. In effect, the problem is that we cannot say what the particles look like only *when they cannot be seen.*

Now this is an uncomfortable thought, because all our instincts tell us that particles must be somewhere, even when we cannot see them. But if quantum mechanics can accurately describe all the information we can ever obtain about the outside world, perhaps we are simply being greedy to ask for anything more. The headline "Physics Fails to Describe Events That Cannot Be Observed" is, again, rather lacking in impact.

The final point is a little vague but more fundamental. If we accept that the future is not fixed, we expect it to contain surprises. Crudely speaking, this is not very plausible in a world where particles have continuous trajectories and an infinite amount of information is freely available. It is much more plausible in a world that is in some way discontinuous, where the available information is limited. Even though we have set aside the question of how a future full of possibilities turns into an unchanging past, it must involve something that seems

pretty weird compared to our normal experience. Perhaps this example of physics not conforming to our expectations is weirdness of the right sort.

The Addition of Spin

It was mentioned earlier that another new idea is needed before the classical physics of electrons and nuclei properly turns into chemistry. That idea is *spin*, a third property of electrons and nuclei alongside mass and electrical charge. Paul Dirac showed that spin is a natural property of charged particles within quantum mechanics. Wolfgang Pauli showed that the spin of the electron prevents more than one electron occupying the same state at the same time—the Exclusion Principle—a fact responsible for the whole of chemistry. The details are not important here, but quantum mechanics with spin seems to account for pretty much all the world we see around us.

Quantum Mechanics—Bringer of Stability

One of the benefits of viewing the quantum world as not fundamentally different from the classical world is that we can imagine how one changes into the other. With a few simple assumptions, a classical world of point-like electrons and nuclei is blindingly chaotic. Atoms are continually trying to collapse, but are prevented from doing so by the huge amount of electromagnetic radiation that is released in the process. It is not the comfortable place that the word *classical* implies.

As we imagine moving to the quantum realm by increasing the size of Planck's constant from zero, something remarkable happens. At some point, the blinding light disappears to reveal stable atoms, capable of forming molecules. Far from making everything go weird, quantum mechanics makes it go normal. To be sure, if Planck's constant increases too far, the atoms fall apart and a different form of chaos takes over, but that just makes the story even more interesting.

So it seems that quantum physics is not weird and incomprehensible because it describes something completely different from everyday reality. It is weird and incomprehensible precisely because it describes the world we see around us—past, present, and future.

Reference

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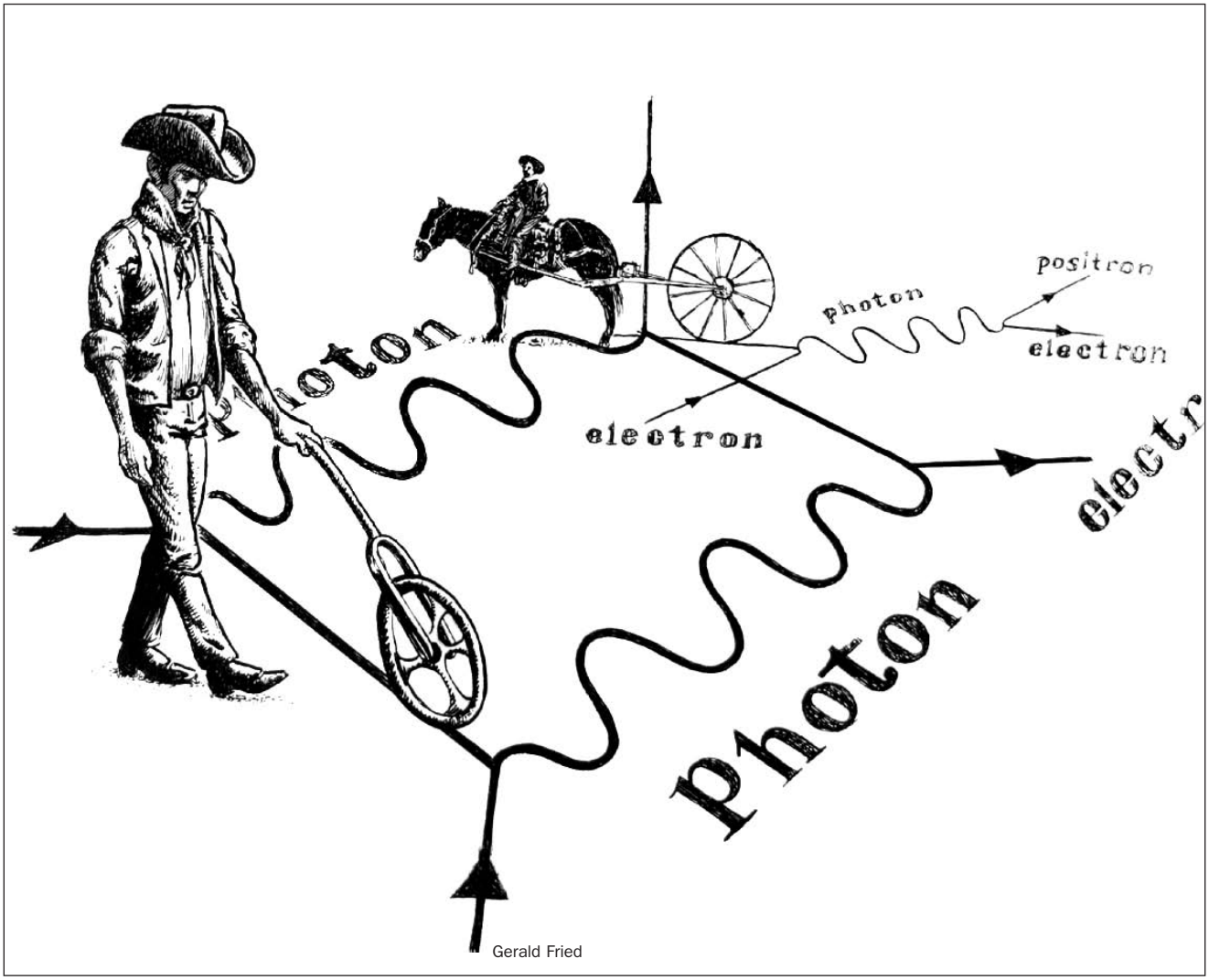

Gerald Fried

Mapping Out the Future with a Surveyor's Wheel

To understand how the quantum mechanism works, it is easiest to describe an analogous situation. Instead of finding out whether there is a path with minimal action to a possible destination, using a "surveyor's wheel" to measure action, we can find out whether there is a path of minimal distance to a possible destination, using an ordinary surveyor's wheel. For reasons that will become clear, we will assume that the wheel has a single spoke connecting the hub to the rim, like the diagram in figure 4.

To use the simple example of a flat plane (analogous to the golf ball example of figures 1 to 3), we start with a particular place and direction and want to find out if another point on the plane is connected to the start by a path with minimal distance. It is obvious to us that this will be true for points directly in line with the starting direction, but we pretend that we don't know this, and have to work it out using our wheel. How is this done?

We suppose that for each possible destination, large numbers of surveyor's wheels roll out to it along every conceivable path, starting with their spokes vertical. They each end up at the destination with their spoke in whatever position the length of the path dictates, but with no record of the path they have taken.

Can we learn from just all these spoke positions if the destination is connected to the starting point by a path of minimal distance? Indeed, we can. Consider that all the possible paths have been tried in some systematic fashion, with the path changing a little bit each time. We don't *need* the paths to have been tested systematically in that order, but if all possible paths have been tried randomly, we can pretend that we have rearranged them systematically.

As we change the path a little at a time, the final position of the spoke, the angle it makes to the vertical, will change smoothly, moving around and around. It will continue to move around and around as we change the path bit by bit in all circumstances *except one*—if the series of paths passes through a path of minimal distance, then a whole bunch of the paths will provide spokes in a similar position.

How can we tell whether our vast collection of spoke positions contains a bunch pointing in roughly the same direction? We can do this simply by putting all the spokes end to end. If there is no path of minimal distance to the destination, the spokes tend to end up in each direction equally often—spiralling around and around—and the end of the "spoke chain" is very near where it started, as in figure 6.

If there *is* a path of minimal distance, on the other hand, the spokes

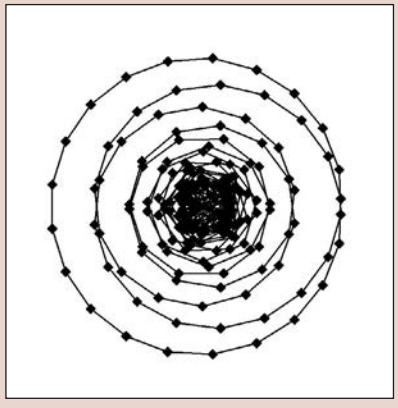

Figure 6: A "spoke chain" for all the paths between the start and a destination where there is no path of minimal distance between them.

from all the paths close to this path will line up, while everything else cancels out as before, so that the end of the "spoke chain" is much further from where it started, as in figure 7.

We don't need to know which path has led to which spoke position. Putting the spokes end to end is all we need to find out what we want to know—whether there is a path of minimal distance to the destination.

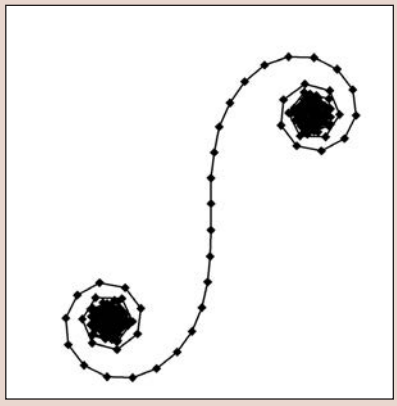

Figure 7: A "spoke chain" for all the paths between a start and a destination where there is a path of minimal distance between them.

This doesn't give us a hard and fast rule for knowing whether there is a minimal path between two places, but it is the best we can do. What we can say is that the *probability* of there being a minimal path is related to the distance between the start and end of the "spoke chain"—the longer the distance, the higher the probability. (The relative probability is actually given by the square of this distance.) In the context of figure 3, the black spots are very dark, and the white spots are very light, but they are all just shades of grey.

Incidentally, the diagrams have been drawn with the spokes from neighboring paths placed next to each other, so that they appear to spiral smoothly around, but this is not necessary. Whatever order the spokes are joined up in, the two ends will be the same distance apart.

It would be fair to say that this is a clumsy, if not ludicrous, mechanism for finding out if there is a path of minimal distance between the start and the destination. But it is a mechanism that uses the simplest of measuring devices, has genuinely no preconceived view of the outcome, and which, in the action version, seems to match what we see around us. □

Science Is for Sale

(And It's Not Only for the Money)

Until all types of threats to scientific integrity are discussed and handled more effectively, they jeopardize the validity of medical research and the public's trust in it. In the end, public resources and patients' health are at stake.

RAGNAR LEVI

The integrity of medical science is seriously threatened by economic interests of the drug industry, warn editors of several leading medical journals. Marcia Angell, former editor of the *New England Journal of Medicine*, writes: "Over the past two decades the pharmaceutical industry has moved very far from its original high purpose of discovering and producing useful new drugs" (Angell 2005). She continues: "Now primarily a marketing machine to sell drugs of dubious benefit, this industry uses its wealth and power to co-opt every institution that might stand in its way, including the U.S. Congress, the FDA, academic medical centers, and the medical profession itself." Her British collegues are no less harsh in their criticism. Richard Horton of the *Lancet* self-critically notes that "journals have devolved into information laundering operations for the pharmaceutical industry" (Horton 2004), and according to Richard Smith, former editor of the *British Medical Journal* and now a board member of the Public Library of Science, "medical journals are an extension of the marketing arm of pharmaceutical companies" (Smith 2005).

While more influential than ever, economic pressures by the drug industry are certainly not the only sources of bias. Many players in the scientific arena are governed by political agendas, career interests, academic competition, envy, hubris, or pursuit of recognition and high social status (Nelkin 1995). Others may suffer from fear of authorities, being unable or unwilling to question false statements, and avoiding conflict at any price. In addition, failures of the educational system may result in ignorance and gullibility among junior researchers. The history of academic medicine provides numerous examples of how the intellectual inertia of senior clinicians and scientists has led to a narrow-minded and irrational resistance to new and important scientific findings.

All these processes may directly contravene the ethical codes in science, first described by the science sociologist Robert Merton as CUDOS (Merton 1973). In brief, CUDOS states that results should be common property of the community and freely communicated (Communalism), and any hypotheses, objections, or criticisms should be considered regardless of the nationality, race, color, or creed of its source (Universality). Scientific results should not be manipulated to serve considerations such as personal profit, ideology, or expediency (Disinterestedness), and scientific statements, which must be open to question, should be accepted on comparison with observed facts, not on word of authority (Organized Skepticism).

Interference with CUDOS is likely to result in a spectrum of practices, from the ideal "Responsible Conduct of Research" (RCR) to questionable research practices and misconduct. Recently, a Delphi survey of forty experts in United Kingdom clinical trials identified thirteen types of misconduct that were judged by majority agreement to be both likely or very likely to distort the results, and likely or very likely to occur (Al-Marzouki 2005). A much larger survey (Martinson 2005) indicates that misbehavior among researchers may be more common than previously assumed. In this sample of more than 3,200 NIH-funded scientists, as many as 33 percent of the respondents admitted to at least one of the ten serious misbehaviors in the previous three years. For example, 6 percent admitted that they had failed to present contradicting data, and more than 15 percent said they had changed the design, methodology, or results of a study in response to pressure from a funding source.

Commercial and noncommercial threats to research integrity are omnipresent. Pressures, biases, and conflicts of interest are unavoidable. When the scientific community fails to openly discuss and handle such threats, problems appear at all stages of the research process.

Biases and Influences on Research

First, when research is funded, the priorities of various sponsors do not always coincide with patients' needs for new research. Relevant studies regarding interventions that will not generate great commercial profits are often not funded (for example studies of major health problems in developing countries, and so-called orphan diseases in developed countries). By contrast, many irrelevant studies do receive funding even if they are redundant in view of previous findings. Sometimes these new studies are an expression of medicalization and disease mongering—attempts to widen the definition of treatable illness to expand the markets for those who sell and deliver treatments (Moynihan 2002). It has also been shown that when a pharmaceutical company funds research into drugs, studies are more likely to produce results favorable to the sponsoring company's product (Bekelman 2003).

Second, research plans often suffer from shortcomings related to methodology and the framing of questions or hypotheses. There may be a biased selection of subjects or an inappropriate comparison and control group. Investigators' expectations for dramatic and long-lasting treatment effects may lead them to initiate underpowered studies or neglect the need for randomization, blinding, and adequate follow-up. Their choice of outcome measures may include surrogate endpoints with little or no clinical relevance. Studies may focus more on benefits than on harm. Intellectual bias at this stage of the scientific process also includes selective inattention to certain issues that do not fit with researchers' preconceptions. Such preconceived notions may have delayed studies of, for example, the benefits of beta-blockers in chronic heart failure, or the risks of hormone replacement therapy.

Third, in the data collection phase of research, various threats to objectivity pave the way for well-known methodological problems such as systematic differences in the care provided, and exposure to other factors apart from the intervention of interest (performance bias), in how outcomes are

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assessed (detection bias), and in the withdrawals or exclusions of people entered into a study (attrition bias).

Fourth, analysis of the collected data entails well-documented problems like data dredging—performing so many statistical tests that significant results are highly likely to appear just by chance, leading to false positive findings. Editing or "cleaning" data can be equally problematic if it means, for example, excluding outliers and tailoring the data to a favored hypothesis. Failing to analyze trial participants in the groups to which they were randomized, regardless of the type of treatment they actually received, is another questionable practice that may be related to stakeholders' desire for a particular result. In addition, there are, of course, innumerable ways to misuse statistical methods.

Fifth, when summarizing, reporting, and interpreting the findings, some authors are tempted to jump to conclusions not justified by the actual results. Overinterpreting the results, confusing correlation with causation, reporting only a biased subset of all the relevant data presented, and omitting important findings in the reported subset may be related to the use of writing assistance or ghost writing. Some well-documented problems include the use of relative risk reductions without mention of absolute risk numbers (Naylor 1992), and designing misleading graphs.

Finally, there is ample opportunity for bias when research findings are to be published, disseminated, and applied. A substantial portion of all studies are not published or delayed (Scherer 2005, Misakian 1998). At the same time, other findings are published repeatedly, either as duplicates or "salami slices" of results (Huston 1996). Consequently, the overall picture may be distorted even though each published study is perfectly valid.

Most scientific findings that reach the general public and health policy-makers have been filtered by the news media. Judgment of every story's newsworthiness or news value, and assumptions about their audience, guide journalists' and editors' selection, style, and formatting of health and medical stories (Nelkin 1995). The news value that journalists and editors attribute to scientific findings rarely reflects their clinical importance (Levi 2001).

Fixing the Problems

It is highly unlikely that scientific observations will pass through all these stages—from the producer to the end users—without being distorted in some way. Preventive measures are urgently needed, and some initiatives have already been taken. Increasingly, declarations of conflicts of interests, such as economic ties, are published in scientific reports. Demands have been raised that clinical trials should use health outcomes that are relevant to patients (House of Commons Health Committee 2005). To avoid a situation in which only desired results are selected for publication (while undesired results remain unknown), many medical journals now require prior registration in a public trials registry as a condition of consideration for publication. The results will not be published unless trials have been registered at or before the onset of patient enrollment (DeAngelis 2004). Leading scientific publications have agreed on common standards for the reporting of scientific results, described, e.g., by the CONSORT statement (Moher 2001).

These steps are necessary but far from sufficient. Efforts to minimize bias must include the whole range of potential sources, even those originating within the scientific community itself. Strengthening the integrity of medical research should be a high priority for all stakeholders, including health care providers, governments, public authorities, health professionals' organizations, research funders, healthcare insurers, political parties and their politicians, patient organizations, as well as individual patients and their families.

The public's trust in medical science is based on its validity. Since biased research results may waste public resources and ultimately harm patients, it is absolutely necessary that all threats to the integrity of medical science are handled more effectively. In fact, it is vital.

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Why Great Thinkers Sometimes Fail to Think Critically

Why did two great thinkers, Arthur Conan Doyle and Alfred Russel Wallace, believe in spiritualism and other paranormal claims? It was not because they lacked critical thinking skills but because they were not disposed to use those skills.

D. ALAN BENSLEY

Sir Arthur Conan Doyle was a physician and a highly acclaimed writer. His famous character Sherlock Holmes was a shrewd detective with formidable powers of reasoning. Yet Conan Doyle showed dramatic lapses in his own critical thinking. He was a devoted convert to spiritualism, believing that living persons could contact the disembodied spirits of the dead through mediums. Furthermore, he believed that eight-inch-tall fairies inhabited the English countryside in Cottingley Glen. Likewise, Sir Alfred Russel Wallace had great intellectual achievements, co-discovering natural selection with Charles Darwin and publishing many innovative, well-reasoned articles. Yet, he too, believed in spiritualism and endorsed phrenology (the

reading of character from bumps on the head), now considered a pseudoscience. How did two men with scientific training and great intellectual achievements come to believe such implausible claims?

It was not because they lacked the skills to think critically. Both had the ability to evaluate the quality of evidence and draw a sound conclusion (Bensley 1998). Rather, they were not motivated to use their skills to think critically about spiritualism and related paranormal claims. The problem was with their disposition to think critically—that is, the attitudes and traits that disposed them to use their critical thinking skills. To better understand their problem, I will first examine critical thinking dispositions and skills. Then, I will use this distinction to analyze the thinking of Conan Doyle and Wallace, comparing them to Charles Darwin, who did not fall prey to these false paranormal claims.

Critical Thinking Dispositions and Skills

Researchers have found that critical thinking skills can be usefully distinguished from dispositions. A critical thinking skills test like the "Tasks in Critical Thinking Test" (Tasks) measures an individual's inquiry and reasoning abilities (Educational Testing Service 1993). In contrast, a disposition measure like the "Need for Cognition Scale" (NFC) measures a person's tendency to engage in and enjoy effortful cognitive activity such as critical thinking (Cacioppo et al., 1984). Research has shown that people who have higher scores on the NFC tend to be more curious, open-minded, open to new experiences, conscientious, and reliant upon empirical and rational information. They also are less dogmatic, close-minded, and authoritarian (Cacioppo et al., 1996). Another dispositions measure, the "California Critical Thinking Dispositions Inventory" (CCTDI), seeks to measure specific dispositions. For example, it assesses the tendency to be intellectually curious, open-minded, to use reasoning and evidence, and to seek truth even if the conclusions do not support one's self interest (Facione, Facione, and Sanchez 1994). In summary, critical thinking skills are thought to be more related to the cognitive ability of reasoning while critical thinking dispositions are more related to cognitive style or the traits and motives that determine the tendency to use those skills in a situation.

Consistent with this view, research has shown that critical thinking skills and dispositions are related, but they are not the same thing, (e.g. Bensley et al., 2005; Facione et al., 1995; Perkins et al., 2000; Stanovich and West 1997). For example, at my university we have consistently found the performance of randomly selected college students on a critical thinking skills test (Tasks) to be positively correlated with two disposition measures, the NFC and CCTDI (Bensley et al. 2005). Although the correlations were significant, they were low to low-moderate ($r = .24$ to $.40$). This suggests that people with good critical thinking skills are inclined to use them, but not always. Interestingly, we have also found some students with high scores on the skills test but relatively low scores on the dispositions measures.

Just because someone has critical thinking skills does not mean that person will use them in every situation. Someone might be skeptical about buying a used car, asking probing questions and carefully weighing the evidence for each vehicle. That same person, however, might accept without question the paranormal claim that John Edward, the celebrity channeler, has communicated with the spirit of someone's dead father.

This suggests an intriguing possibility. Perhaps eminent thinkers might not be inclined to use their superior critical thinking skills in some situations. This could occur if using their skills led them to conclusions contrary to their cherished beliefs. They might, for example, be less skeptical of an idea they wanted to believe. We often think of skepticism as an act of questioning assertions, suspending belief, and good reasoning (Kurtz 1992). But if someone does not lean toward healthy skepticism in the first place, then that person may not behave in ways that show good reasoning (Perkins, Jay, and Tishman 1993). From this perspective, skepticism is also a disposition. Perhaps a lack of skepticism, fair-mindedness, or other dispositions prevented Conan Doyle and Wallace from thinking critically about spiritualism.

Was Conan Doyle Not Disposed to Think Critically?

Basic facts from Conan Doyle's life make it unlikely that he lacked critical thinking skills. He studied medicine at Edinburgh University, a premier medical school. His biggest influence at medical school was Joseph Bell, an excellent teacher, scholar, and physician. By careful observation of a patient's characteristics, symptoms, and appearance, Bell could correctly infer a surprising number of facts. Once, without any prior information about a man, Bell determined he was a recently discharged, non-commissioned officer from the Highland Regiment, stationed in Barbados who had contracted elephantiasis. When Conan Doyle became clerk of Bell's clinic, he had many opportunities to observe Bell's brilliant diagnostic reasoning. Conan Doyle later incorporated many good examples of this style of reasoning into his portrayals of how Sherlock Holmes solved crimes (Booth 2000).

Conan Doyle further demonstrated his critical thinking skills when he wrote a series of newspaper articles in defense of George Edalji, a myopic young lawyer wrongfully convicted of mutilating livestock (Hines, Womack, and Doyle 2001). Conan Doyle found many holes in the prosecution's arguments. Using his knowledge of the eye and the expert opinion of an eye specialist, Conan Doyle argued persuasively that George's severe vision problems would have prevented him from traveling the mile of rough terrain in the pitch black of night in time to commit the crime and return home. Conan Doyle offered a well-reasoned accounting of the facts, considering the evidence on all sides and responding well to rebuttals

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Sir Arthur Conan Doyle

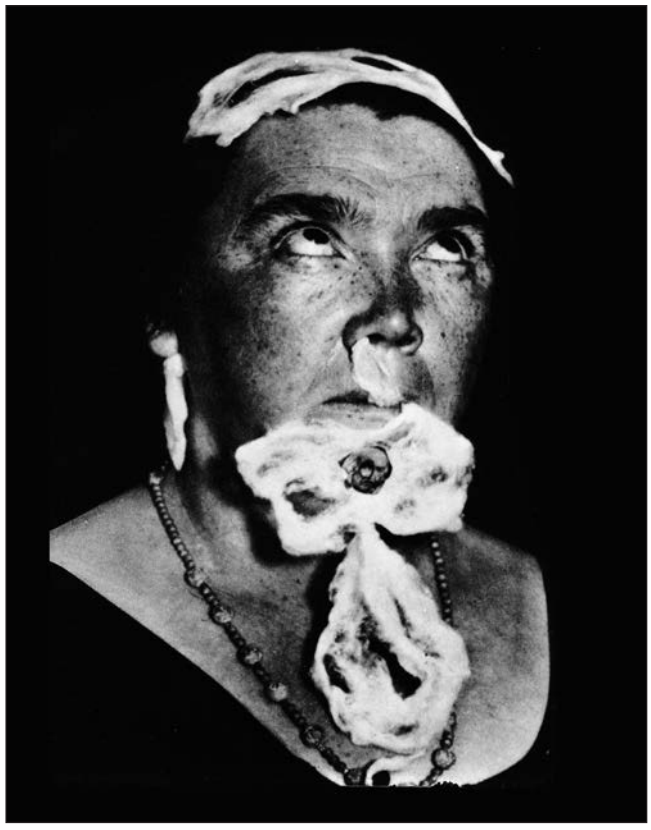


Figure 1. Ectoplasm extruding from the mouth of medium Mary M. at a 1929 séance. Note the cottony-like material of the ectoplasm seems to contain a likeness of British Prime Minister William E. Gladstone. From *Psychic Powers*. Edited by Neil Kagan, Pat Daniels, and Anne Horan. 1987. Alexandria, Virginia: Time-Life Books.

to his arguments. But perhaps most impressive of all, he used his critical thinking skills to actually solve the crime and identify the perpetrators!

Conan Doyle was not as disposed to use his formidable reasoning skills when thinking about spiritualism. In 1880 he attended his first lecture on the topic, which aroused his curiosity but did not convince him. His medical training likely made him resist the claim that the soul survives physical death. Materialistic scientists seeking to explain the mind or spirit in physical terms have long been skeptical of the survival hypothesis. These days, survival often seems implausible to skeptics acquainted with research showing that the mind depends on brain activity (Bensley 2003). But in Conan Doyle's day, it would have seemed more plausible.

The connection between the spiritual and the physical worlds was a problem for spiritualism, too. How could the nonphysical spirit manifest itself in the physical world of the living? According to spiritualists, a medium was a conduit between the spiritual and physical worlds. Connection between the two worlds was thought to occur when a medium extruded ectoplasm or other material from her mouth, vagina, or other orifice. As shown in figure 1, ectoplasm sometimes took the form of a glowing ribbon, or even the face of the dearly departed. To the credulous Conan Doyle, the ectoplasm was the spirit manifesting in physical form. To an expert observer like a magician, however, it would have been recognized as fluffy cloth with luminous paint (Randi 1995).

Conan Doyle became more convinced as he explored these phenomena with friends such as General Alfred Wilks Drayson. Drayson was an accomplished writer, scientist, mathematician, and astronomer who believed he had contacted his dead brother through a medium. At one séance, a medium told Conan Doyle that she was speaking for a traveler who had been killed in a theater in Exeter. The "spirit" instructed Conan Doyle to contact his family at Slattenmere in Cumberland. Conan Doyle posted a letter to the address, but the letter was never answered because no such place exists in Britain. When he asked Grayson about this troubling development, Grayson responded that charlatans populated both this world and the next. Conan Doyle seemed to conclude that mediums would only resort to trickery when their powers were not working.

Conan Doyle's conversion to spiritualism was mostly based on two kinds of evidence: the endorsement of famous scientists like William Crookes, and more importantly his experiences at séances. Yet, the challenges of skeptical scientists and his own negative experiences at séances had little effect on his belief. In 1887 he wrote a very positive article on his experiences for *Light*, the journal of the London Spiritualist Alliance. This (and a later article) signal his acceptance of spiritualism, but he did not formally declare his belief until 1916. In 1917, just two weeks before the end of World War I, Conan Doyle's son Kingsley, weakened from the war and pneumonia, died. Within hours of his death, Conan Doyle contacted Kingsley through a medium. This personal experience further solidified his belief.

One experience that might have shaken his belief occurred in 1919 when journalist Sidney Mosley invited Conan Doyle to a séance. Before the demonstration began, those attending put a personal article into a black velvet bag that was then locked in a black box. Conan Doyle put Kingsley's ring in the bag. Without opening the box and bag, the medium told each person what was inside. When she announced that she saw a ring with Kingsley's initials on it, Conan Doyle was very impressed. But he was not the least bit amused when told that the "medium" had used trickery. With the aid of a magician, they had replaced the box and bag with duplicates and then opened the originals out of sight to determine the contents. This trickery did not dissuade Conan Doyle from spiritualism; instead, he continued to promote it.

During this period, he made friends with the magician and escape artist Harry Houdini, who often exposed the trickery of mediums (Houdini 1924). Houdini told him how a famous medium, Ira Davenport, had confessed that he used trickery to create believable séances. Conan Doyle replied that he didn't put much faith in the confessions of spiritualists. He said it was a common trick to say that mediums had confessed. This further reveals Conan Doyle's bias in evaluating the evidence. He even said that Houdini's amazing demonstrations were due to Houdini's own (unrecognized) psychic powers, a claim that Houdini categorically denied (Polidoro 1998).

Similarly, Conan Doyle did not seriously question the Cottingley fairy photographs taken by ten-year-old Francis Griffiths and her cousin, sixteen-year-old Elsie Wright. He seemed to ignore the fact that experts from Kodak said they could produce similar photographs. Just as he was unwilling to use Houdini's expert advice on the deception of mediums, he was also unwilling to use the expertise at Kodak to further investigate the photographs. Instead, he paid undue attention to the opinion of a presumed photography expert who agreed with him about their authenticity. Nor did it bother Conan Doyle that Elsie worked in a photography shop and had the artistic ability to create the fairies (Randi 1982). He could not believe that girls from an honest country family would deceive anyone, just as he trusted the claims of mediums—who were often women.

These examples show that Conan Doyle was treating the evidence favoring his own position differently from the evidence opposing it. In so doing, he was committing a common thinking error called confirmation bias. In other words, Conan Doyle's lack of skepticism was partly due to his failure to show the disposition of fair-mindedness.

His lack of skepticism, however, seems to have been limited to spiritualism and paranormal claims. For instance, in 1890 a London newspaper sent him as a physician to cover the presentation of Robert Koch's groundbreaking research on inoculation for tuberculosis at a Berlin medical conference. After carefully studying Koch's methods and patients treated with it, Conan Doyle said he regretted that he could not yet report a cure for TB and that the promising initial findings required further research. He made these skeptical comments despite the hopes of many that a cure had been found. Similarly, during his student years, he became increasingly skeptical of Catholic doctrine. As he questioned these beliefs, he came to reject Christianity and moved towards a science-based belief system. It may be that his loss of faith troubled him and that spiritualism filled a gap that science could not. Like other Victorian-era intellectuals, he may have replaced traditional religion with an amalgam of beliefs in theism, supernatural forces, and science (Cerullo 1982). It is telling that he preferred to call spiritualism "psychic religion," and he viewed himself as a sort of missionary to spread its truth (Booth 2000). This raises the question of whether scientists of his era who abandoned their traditional faith for spiritualism showed similar problems with their thinking.

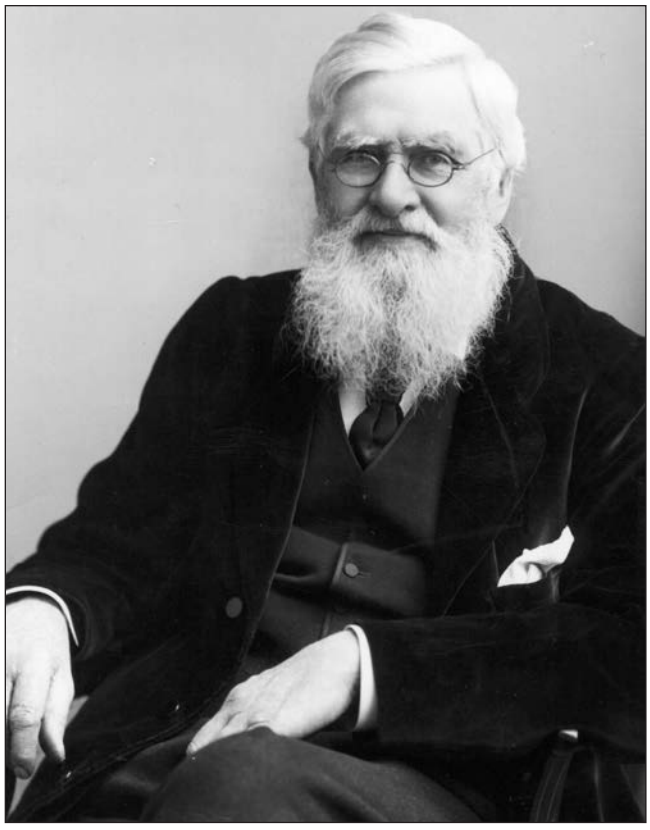
Why Was Wallace a Spiritualist?

Alfred Wallace did not lack critical thinking skills. Like Darwin, he supported his version of evolutionary theory with vast amounts of field data, making two long expeditions to the Amazon and the Malay Archipelago. Wallace showed good reasoning in his scientific articles, publishing 191 articles in the prestigious journal *Nature* and hundreds more in the best peer-reviewed journals of his day (Shermer 2002).

Wallace did not have as much formal education as either Conan Doyle or Darwin, but he read extensively as a young man. In his seventh and final year of schooling he worked as a tutor when his family could no longer pay his tuition. At fourteen, he went to work with his brother, later learning surveying. At night they attended Mechanics' club meetings, informal science clubs much like night school for young working-class thinkers. He was exposed to the socialist ideas of Robert Owen and began his lifelong concern for improving the social conditions of workers.

Wallace's interest in methods for improving the human condition attracted him to the pseudosciences of phrenology and Mesmerism. When, for example, the phrenologists Hicks and Rumbell examined thirty areas of Wallace's head, they reported he had a small organ of Veneration and relatively larger areas for Ideality and Wonder, as shown in figure 2. Wallace thought his smaller area of Veneration was consistent with his disregard for mere authority and his large area for Wonder with his fascination for the beautiful and mysterious (Fichman 2004). He may have been inclined to believe these trait descriptions because of their generality. Or, these three apparent "hits" may have been just three lucky guesses among thirty attempts. At any rate, Wallace found these kinds of personal experiences to be strong evidence for phrenology.

By the late 1860s Wallace advocated spiritualism as a legitimate area of scientific study. Like Conan Doyle, he believed science would ultimately validate its claims. But both men became frustrated as scientists and magicians repeatedly exposed the tricks used by mediums. When he pressed other colleagues like Charles Darwin and Thomas Henry Huxley to study spiritualism, they refused. Darwin disapproved of spiritualism and quietly gave ten pounds to help pay the costs of prosecuting Henry Slade, a medium sued by biologist Edward Ray Lankester. Despite Wallace's testimony on his behalf,



Sir Alfred Russel Wallace

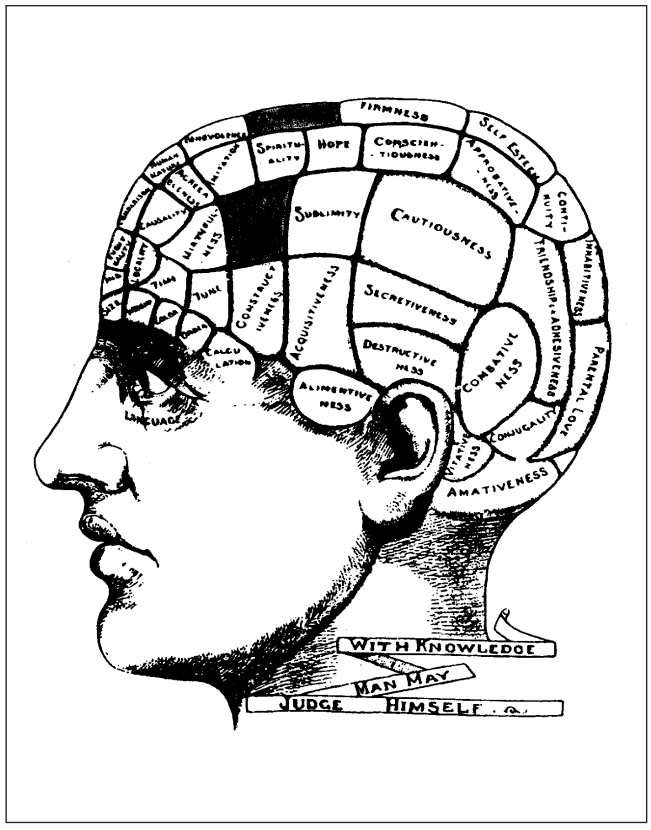


Figure 2. A phrenological diagram showing two of Wallace's exceptional traits in gray according to Hicks and Rumbell. As noted by Bensley (2002), it is implausible that indentations and protrusions in areas of the skull would in any way correspond to the amount of underlying brain tissue for such traits.

Slade was convicted of using trickery to produce what he claimed were real psychic effects (Shermer 2002). At the trial of another medium, Wallace testified that he had "never met a medium who was a scoundrel" (Oppenheim 1985). Although some scientists admired his courage for studying spiritualism, others like W. B. Carpenter publicly accused Wallace of being credulous. In fact, by virtue of his belief in mediums' claims, Wallace believed in apparitions, ghosts, haunted houses, clairvoyance, levitation, and spirit photography.

In his psychological biography of Wallace, Michael Shermer has argued that Wallace's personality characteristics explain his gullibility. Shermer and Frank Sulloway had ten historians of science complete a forty-item personality inventory rating Wallace and Darwin on a nine-point scale with questions like "I see Wallace as someone who was rebellious (1) to conforming (9)." Note that ordinarily these kind of personality scales use the self-reports of the individuals in question to infer their traits, but since this was not possible Shermer and Sulloway had historians rate them using the scales. Self-reporting usually produce differences on five dimensions including: openness to experience, conscientiousness, agreeableness, extroversion, and neuroticism. Wallace scored at the 86th percentile on openness and at the 84th percentile on conscientiousness while Darwin was at the 99th percentile on both. Shermer argued this pattern of high openness to experience was consistent with both men fitting a heretic personality profile in that both were open to radical ideas and change. He further argued that Darwin's higher level of conscientiousness reflected his greater intellectual conservatism and made him more skeptical than Wallace by keeping his high levels of openness in check. Also, Wallace was more agreeable and so tended to go along with various outlandish claims.

This personality analysis seems plausible at a general level, but it does not go far enough in explaining why Darwin was more skeptical of spiritualism than Wallace yet both were skeptical of traditional religion. By analyzing their specific thinking dispositions and beliefs, we may better understand their differences. It seems clear that, like other creative scientists, both Wallace and Darwin showed high levels of openness to experience. It is less clear, however, why Wallace had a lower score on this trait than Darwin. Wallace investigated many more different areas of science than did Darwin, and was more open to studying questions at the borderlands of science. For example, Darwin never attended an entire séance. The one time his son George and brother-in-law Hensleigh invited him to one, he said he felt ill and rested upstairs while the others participated. Interestingly, Wallace's response to scientists who accused him of being credulous about spiritualism was to accuse them of not being open-minded enough (Wallace 1871).

Another important difference between believers like Wallace and skeptics like Darwin was in how much they were willing to trust their personal experience as evidence. Whether Wallace was observing plants or people, he believed that what

he observed was what was there. Like Conan Doyle, Wallace naïvely trusted his own experience at séances, believing that what mediums showed him was real and not the result of misdirection or illusion. Likewise, both men failed to appreciate the role of expert observers in detecting fraudulent mediums. As Houdini (1924) noted, magicians are especially adept at finding deception in séances.

Wallace's thinking dispositions are best understood in the context of his beliefs about God and human progress. Like Conan Doyle, Wallace rejected traditional religion as a young man but advocated theism most of his life.

Wallace's thinking dispositions are best understood in the context of his beliefs about God and human progress. Like Conan Doyle, Wallace rejected traditional religion as a young man but advocated theism most of his life. Yet, Wallace's God was not the God of Christianity, but a powerful intelligence that ordered the world. In contrast, Darwin rejected theism and the notion of an afterlife, describing himself as an agnostic (Darwin 2000). After Conan Doyle lost Kingsley and Wallace his brother, they sought to contact them through mediums and believed they had. After Darwin lost his beloved young daughter Annie to disease, he rejected the notion of an all-loving God and the related notion of an afterlife. Darwin's more skeptical attitude toward the afterlife made him less open to having the gripping personal experiences that Conan Doyle and Wallace found so convincing. Yet, Wallace did not simply believe in spiritualism because of the promise of an afterlife. Rather, he believed in it because it fit well with his prior beliefs in human progress and the special nature of the human mind (Oppenheim 1985).

This is well illustrated in his revision of the evolutionary theory he and Darwin proposed. To accommodate his ideas of human progress and a Supreme Intelligence ordering human existence, Wallace proposed that the human mind was special and exempt from natural selection. This revision, harking back to God's special creation of humans in the Bible, irked Darwin. Likewise, Wallace's core beliefs disposed him to accept the questionable evidence of mediums suggesting that humans had special mental powers and were progressing to new levels. The result was to evaluate this dubious evidence as support for his prior beliefs. Thus, the same Wallace who used his critical thinking skills to co-discover natural selection was not inclined to use them to examine spiritualist claims resonating with his prior beliefs.

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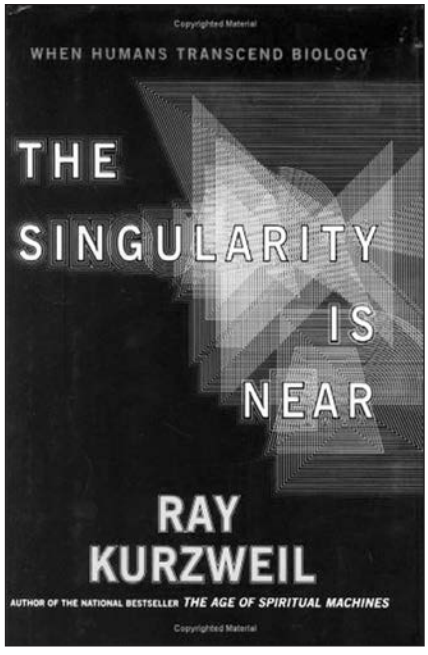
Evolution's Radical Future

JAMES N. GARDNER

The Singularity Is Near: When Humans Transcend Biology. By Ray Kurzweil. Viking, New York, 2005. ISBN 0-67003384-7. 672 pp. Hardcover, $29.95.

If Charles Darwin were alive today and aware of the truly revolutionary trends occurring in what might be called the extended terrestrial biosphere (i.e., the totality of all life on Earth plus all of life's artifacts, a similar but more limited concept of which was articulated by Richard Dawkins in *The Extended Phenotype*), he would surely conclude that the sturdy engine of evolution, its vital force undiminished by the passage of centuries, is poised to effect a change perhaps as important as the Cambrian Explosion half a billion years ago. Darwin would likely conclude as well that *artificial* selection—of which he made artful metaphorical use in *The Origin of Species* to illustrate his hypothesis of speciation through natural selection—has, in our modern era, virtually displaced *natural* selection as evolution's key propellant, at least with respect to the future pathway of human biological development. And the theorist would doubtless contemplate with awe the abiding reality that deep geological time—the enormous stretch of millennia that utterly dwarfs a human lifespan and challenges the very capacity of our biologically evolved human imagination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to conceive of its vastness—remains the vital arena in which evolution's epic story continues to unfold.

But Darwin would immediately recognize that there is a crucial difference between the process of natural selection as it operated in the distant past and the novel possibilities currently open to the evolutionary process. He would conclude that, while a vision of time's immensity remains the vital key in reaching an understanding of evolution's radical potential, it is a realization of the fathomless magnitude of *future time* and *future history* that is of utmost importance today. A modern Darwin would concur with the conclusion of physicist John Wheeler: Most of the time available for life and intelligence to achieve their ultimate capabilities lies in the distant cosmic future, not in the cosmic past. As cosmologist Frank Tipler has bluntly stated, "Almost all of space and time lies in the future. By focusing attention only on the past and present, science has ignored almost all of reality. Since the domain of scientific study is the whole of reality, it is about time science decided to study the future evolution of the universe."

Although you won't read about in any *New York Times* or *Wall Street Journal* headline, the disruptive potential of future evolution is the emerging leitmotif in advanced biological theorizing today. The current intelligent design dust-up on which the popular press myopically focuses will turn out to be a minor historical footnote to the portentous evolutionary drama soon to reveal itself.

Darwin's ghost is unlikely to grace us with a timely appearance, but happily a satisfactory substitute is available: Ray Kurzweil, author of a magisterial new book entitled *The Singularity Is Near: When Humans Transcend Biology*. Kurzweil is a computer scientist, prolific inventor, and gifted futurist best known for his two previous bestsellers about artificial intelligence—*The Age of Intelligent Machines* and *The Age of Spiritual Machines*. Bill Gates' enthusiastic blurb for Kurzweil's latest tome proclaims that "Ray Kurzweil is the best

James N. Gardner is the author of Biocosm: The New Scientific Theory of Evolution: Intelligent Life Is the Architect of the Universe. Biocosm *was selected as one of the top ten science books of 2003 by the editors of Amazon.com.*

person I know at predicting the future of artificial intelligence," and MIT guru Marvin Minsky gushes that this is "a brilliant book with deep insights into the future from one of the leading futurists of our time." This fulsome praise may be on the mark but it misses the most important point about Kurzweil's current contribution. *The Singularity Is Near* is not primarily a set of predictions about the future of computing or even technology in general. Rather it is a uniquely well-informed, technically literate, and blindingly honest speculation about the very future of evolution itself. *Singularity* is a book that Charles Darwin would have written were he steeped in the ongoing technological revolution that is engulfing our world. As such, it should be required reading for anyone seriously interested in exploring what lies over the horizon in life's journey from primordial bacterium to transcendent mind.

What's coming next on the evolutionary road, Kurzweil believes, can be inferred from a set of overlapping trends summarized in the 1950s by the legendary information theorist John von Neumann: "The ever-accelerating progress of technology . . . gives the appearance of approaching some essential singularity in the history of the race beyond which human affairs, as we know them, could not continue."

This scary quotation is, in Kurzweil's view, the key to understanding the future of evolution:

> Von Neumann makes two important observations here: *acceleration* and *singularity*. The first idea is that human progress is exponential (that is, it expands by repeatedly *multiplying* by a constant) rather than linear (that is, expanding by repeatedly *adding* a constant). The second is that exponential growth is seductive, starting out slowly and virtually unnoticeably, but beyond the knee of the curve it turns explosive and profoundly transformative. The future is widely misunderstood. Our forebears expected it to be pretty much like their present, which had been pretty much like their past. Exponential trends did exist one thousand years ago, but they were at that very early stage in which they were so flat and so slow that they looked like no trend at all. As a result, observers' expectation of an unchanged future was fulfilled. Today, we anticipate continuous technological progress and the social repercussions that follow. But the future will be far more surprising than most people realize, because few observers have truly internalized the implications of the fact that the rate of change itself is accelerating.

What specifically can we anticipate from this process of accelerating change in the near future? What does the coming era of the "singularity"—defined by Kurzweil as "a future period during which the pace of technological change will be so rapid, its impact so deep, that human life will be irreversibly transformed"—hold in store for humanity?

First and foremost, the fusion of human and machine intelligence. In the post-Singularity era, Kurzweil predicts, there will no distinction between human beings and their technologies. As we merge with our machines, we will become something more than merely human. The Borg-like hybrid entity that is our evolutionary destiny will, in Kurzweil's words, "match and then vastly exceed the refinement and suppleness of what we regard as the best of human traits." But, alas, from the "perspective of unenhanced biological humanity" this future state of affairs "will appear to rupture the fabric of human history." The only thing that will remain unequivocally human in such a world will be what Kurzweil regards as the defining trait of our humanity: the instinct to "extend [humankind's] physical and mental reach beyond current limitations."

The limitations that we will transcend will be mental as well as physical. Kurzweil forecasts that we will have personal computer-sized devices capable of emulating human-level intelligence within two decades and effective software models of human thought processes by the mid-2020s. Once machines achieve this level of sophistication and are given the power to improve their own designs, they will inevitably rush past our slower biological brains, achieving mental skills that we can scarcely imagine.

Is this radical vision truly as dystopian as it appears—the end of humanity as we know it? Kurzweil offers a coy answer:

> The intelligence that will emerge [post-Singularity] will continue to represent the human civilization, which is already a human-machine civilization. In other words, future machines will be human, even if they are not biological. This will be the next step in evolution, the next high-level paradigm shift. . . . Most of the intelligence of our civilization will ultimately be nonbiological. By the end of this century, it will be trillions of trillions of times more powerful than [unenhanced] human intelligence. However, to address often-expressed concerns, this does not imply the end of biological intelligence, even if it is thrown from its perch of evolutionary superiority. Even the nonbiological forms will be derived from biological design. Our civilization will remain human—indeed, in many ways it will be more exemplary of what we regard as human than it is today, although our understanding of the term will move beyond its biological origins.

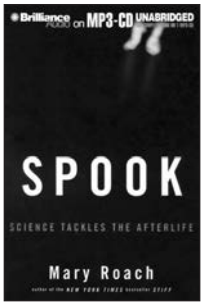
Just how far will our nonbiological progeny move beyond those origins? In Kurzweil's exuberant view, very far indeed. In fact, he predicts that the ultimate destiny of brainy thinking machines will be to saturate the entire universe with intelligence:

> In the aftermath of the Singularity, intelligence, derived from its biological origins in human brains and its technological origins in human ingenuity, will begin to saturate the matter and energy in its midst. It will achieve this by reorganizing matter and energy to provide an optimal level of computation . . . to spread out from its origin on Earth. . . . [T]he "dumb" matter and mechanisms of the universe will be transformed into exquisitely sublime forms of intelligence . . . This is the ultimate destiny of the Singularity and of the universe.

In short, a capacity to engage in "intelligent design" of the entire universe is the predicted culmination of the biological and technological evolutionary process that began, so long ago, right here on humble planet Earth.

Kurzweil does not, in the style of the ID community, pose such a capability as a challenge to Darwinian orthodoxy. On the contrary, the ultimate capacity of intelligence is presented as an extension and refinement of Darwin's classic proposition that nature's organized complexity can be explained primarily on the basis of natural selection. According to Kurzweil's worldview, the emergent ability of intelligence to configure and manipulate matter with ever-increasing sophistication is the hypothesized end result of an evolutionary process that begins with "dumb" Darwinian natural selection, passes through a technology-creating threshold (which corresponds to our current era), and culminates with the triumph of highly evolved mind over matter and the transcendence of the "dumb" forces of inanimate nature.

Kurzweil's brave vision is in the spirit of Charles Darwin's historic theory—an entirely plausible and utterly iconoclastic analysis of life's seemingly miraculous capacity to yield, in Darwin's unforgettable phrase, "endless forms most beautiful and most wonderful" through fully naturalistic means. The fact that, like Darwin, Kurzweil tends to demote humanity from the centerpiece of creation to a supporting role in the vast emerging spectacle of the cosmos is perhaps his greatest intellectual virtue.



The Big Sleep or Just a Nap?

GREG MARTINEZ

Spook: Science Tackles the Afterlife. By Mary Roach. W.W. Norton & Company, New York, 2005. ISBN 0-393-05962-6. 311 pp. Hardcover, $24.95.

Dr. Kirti S. Rawat is the director of the International Centre for Survival and Reincarnation Research. A retired philosophy professor from the University of Rajasthan, as depicted by Mary Roach in her sharp and witty *Spook: Science Tackles the Afterlife*, he seems less a scientific researcher than a minor character from a V. S. Naipaul novel, sprung to a guileless and dithery life.

He serves as Ms. Roach's guide through the "discipline" of reincarnation research, but also serves as travel agent. He switches their hotel after just a night's stay in Dehli to the place where he camped with famed reincarnation researcher/popularizer Ian Stevenson (whose work was dissected in these pages in 1994) while they worked together. Roach lists the hotel's notable deficiencies, but "Dr. Rawat likes the vegetarian dinners, and the service is attentive to the point of preposterousness." He is a take-charge kind of guy, and clearly prefers that role. He arranges a car and driver for them, but the car is a 1965 Ambassador. Rawat admits that the car is "beginning to be outmoded," but what he really likes is the driver: "He is submissive. Generally, I like people who are submissive."

He also appears to like flimsy stories and giving people immense benefit of doubt while entertaining their stories of past lives. Roach dutifully follows in his wake for several days, trudging through (and losing shoes in) mud and dirt to get to the remote houses in which Rawat has found subjects for his research. In spite of the fact that these stories are utterly lacking in substance and proof, Rawat soldiers on through his interviews and questionnaires, gathering data and information in what he resolutely believes is the interest of science.

Rawat is only the first of dozens of intrepid individuals profiled in this smart and often hilarious volume. The cast of characters includes professional scientists, dedicated amateurs, inspired fools, and outright kooks, all following rather dubious paths that try (in vain) to apply the rigors of scientific inquiry to questions that fall solidly out of the scientific mainstream, and probably have no point in being asked in the first place. What is being done in the interest of science inevitably runs smack into the hard fact that the "science" of reincarnation is shaky, and that science is not terribly interested in the subject in the first place—present-day science, that is.

Spook is richly researched and provides a vivid picture of just how much of a preoccupation the question of the afterlife has been for humans for many millennia. In the second chapter, "The Little Man inside the Sperm, or Possibly the Big Toe," Roach narrates a sweeping survey of the vast array of theories on the question of the nature and origin of the human soul. Aristotle posited that the soul was to be found in semen. Herotodus, while busily dissecting cadavers in the third-century B.C., reported discovering the soul as residing in the fourth chamber of the brain. Leonardo da Vinci eventually corrected him by placing it at the top of the spine. Anton van Leeuwenhoek trumped them all: His research with early microscopes revealed the existence of tiny "animacules" with tails thrashing about in ejaculate. He went on to craft the theory of preformationism, postulating that a teeny, tiny person rested inside the sperm and, after sufficient incubation inside the host mother, would emerge as a human being with an everlasting soul.

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Roach spends considerable time with those who continue this quest in the present day. She enrolls in a three-day course titled "Fundamentals of Mediumship" at "England's stately and ancient Arthur Findlay College." She visits a sheep ranch in Bend, Oregon, to inspect the rancher's soul-weighing operation (which is not the first of its kind). She journeys to Canada to allow a neuroscientist to expose her brain to electromagnetic fields in an effort to detect ghost "presences." She accompanies members of the International Ghost Hunters Society to a national forest in California to record "spirit voices." These are only a few of the many figures she pursues and profiles.

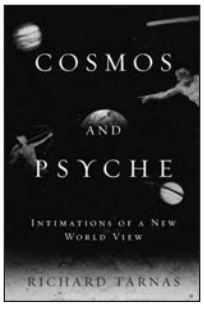
Most hilariously, she describes in priceless detail her queasy trip to the Cambridge Manuscripts Reading Room at Cambridge University to examine ectoplasm. In 1989, Cambridge University acquired the archives of the British Society for Psychical Research, one portion of which is ectoplasm materialized by the medium Kathleen Goligher at a séance in 1939. Roach sets her scene in the church-like quiet of the reading room, where she restlessly waits to open the box containing the sample. She has been warned by a representative of the Society that the sample is unpleasant. A card attached to the box containing it gives a brief summary of the background of the object, reading in part:

> She had been stripped and searched with no vaginal examination. The material was smelling and had bloodstains on it which appeared at regular intervals. The suggestion was that the blood had soaked into the material while it was folded up, and that the most likely explanation was that it had been secreted in the vagina.

Roach delays examining the item until the room has mostly cleared, for fear of causing a scene. Would the item be some fossilized sheep omentum, like so many of the materializations turned out to be, or some sort of ethereal tampon? While waiting, she reviews the contents of the many pages of documentation accompanying the file, and then weaves in her own research into the ectoplasm phenomenon (including other investigators speculations about second or false stomachs and rumination of the objects). The farcical history of this hoax only enhances the mirth. Finally, late in the day and with only one sitter still in the room, Roach opens the package and unfolds a swath of cheesecloth nearly thirty square feet in size. The smell is notable but manageable, and the bloodstains mere brown smears. Like most things psychical, it is not what it purports to be, but the chapter is a masterpiece of very real gross-out comedy.

Describing this project as a "giggly, random, utterly earthbound assault on our most ponderous question," Roach's primary comic device is to allow her subjects to speak for themselves, often at great length (giving them enough rope, in a way). A woebegone professor of obstetrics at Duke University whom she interviews regarding his side project of applying a quantum-theory equation to measure the energy lost when the soul departs the body admits that he cannot find any collaborators to assist him on his project. His marriage has long since dissolved and his colleagues avoid the subject or reject it outright. He sadly tells her, "Most people don't listen nearly as long as you have."

As much fun as it is, *Spook* also functions as a friendly, informal warning to scientists and researchers who may contemplate wading into the murky waters of paranormal research. With so many of your predecessors having gone down this path and produced little more than folly, you may want to reconsider. *Spook* is a sort of anti-how-to book for these folks: here is what not to do and here is how not to do it.



Saving a Disenchanted World with Astrology?

GEOFFREY DEAN

Cosmos and Psyche: Intimations of a New World View. By Richard Tarnas. Penguin Viking. 2006. ISBN 0-670-03292-1. 569 pp. Hardcover, $29.95.

Thanks largely to science, argues Richard Tarnas, we live in a meaningless, disenchanted world. But we can be saved by astrology, which offers "a royal road across the threshold of the disenchanted universe into a living cosmos of profound unfolding meaning and purpose." Anyone familiar with astrological writings will have heard such claims before. This time the difference is that Swiss-born Tarnas is a professor of philosophy and depth psychology at the California Institute of Integral Studies in San Francisco.[1] His 1991 best-seller *The Passion of the Western Mind: Understanding the Ideas that Have Shaped Our World View* has been adopted as a text by many American universities. His views would therefore seem to deserve attention.

Geoffrey Dean is a technical editor in Perth, Western Australia (Box 466, Subiaco 6904, Western Australia). A CSICOP Fellow and former astrologer, he and his associates have been investigating astrological claims since the 1970s.

In an interview in *The Mountain Astrologer* (Dec. 2005/Jan. 2006, pp. 45–51), with a preamble from which the above quote is taken (p. 43), Tarnas says *Passion* started out as a history of astrological ideas and ended up as a history of Western worldviews. *Passion* divides world views broadly into: Greek (from 500 B.C.); Christian (peaking in the Middle Ages); and Scientific (from about 1700). It hints at a coming worldview based on "the emergence of a dialectically

integrated, participatory consciousness reconnected to the universal" (p. 440), but gives no further explanation.

In his new book Tarnas slowly lets on that *Passion* was hinting at astrology. He tells us: "Like most products of a modern education [he graduated from Harvard], I myself long viewed any form of astrology with automatic skepticism." Tarnas then noticed that many famous people in history (e.g., Plato, Aquinas) had supported astrology, apparently without noticing that many other famous people (e.g., Cicero, Augustine) had rejected it. The clincher came when he started looking at the birth charts of himself and others, and at historical events. Like everyone else who does this without controls, he was "deeply impressed by the range and complex precision of the empirical correspondences" (p. 65). The result was his firm belief that astrology promises "the emergence of a new, genuinely integral world view," one that "can reunite the human and the cosmic, and restore transcendent meaning to both."

Interestingly, Tarnas's belief seems to receive academic support from Roy Willis and Patrick Curry in their 2004 book *Astrology, Science, and Culture* (Curry teaches graduate astrology courses focusing on cultural astronomy at Bath Spa University College in England). Like Tarnas they argue that our disenchanted world can be saved by astrology. But contrary to Tarnas the astrology that will save us is *divinatory* astrology, which Tarnas sees as an "unexamined (and often problematic) conflation of . . . archetypal insight and concrete prediction."

Back at *Cosmos and Psyche*, Tarnas's claims are illustrated by an impressive array of examples that with notes occupy more than 400 pages. The examples are drawn from philosophical, religious, literary, and scientific sources and involve two kinds of comparison, namely historical events versus aspects between the five outer planets Jupiter through Pluto, and prominent people versus their birth charts. In each case Tarnas explains what the particular astrological factor means and how it can be discerned in the events or births that are coincident with it. And vice versa. For example, the tension of Saturn-Neptune in 2005 coincided with the Asian tsunami and New Orleans flooding, or given the traditional connection of Neptune with the sea, "death caused by water." Why the rest of us survived is not explained. Nevertheless Tarnas sees this sort of thing as clear evidence for astrology.

Unfortunately Tarnas dismisses statistical studies as "methodologically inadequate for . . . the astrological tradition" (p. 76), which lands him in deep trouble. For example, among five outer planets there are ten possible pairs, of which Tarnas considers six. He seems unaware that, under his rules, each pair is in aspect nearly 80 percent of the time. So there will nearly always be several pairs in aspect during any historical event, of which there is an almost unlimited supply. And vice versa. Since a whole pageful of words may be insufficient to describe the astrological possibilities of each pair, finding a correspondence in all this mess will be even easier than seeing faces in clouds, and just as meaningful. With so much going on up there, one wonders how the Dark Ages managed to be so dark.

Similar problems arise when Tarnas looks at birth charts. He rarely gives the birth chart or even the birth data for his examples (the "trust me" syndrome). Worse, he routinely breaks the #1 Golden Rule of Astrology, perhaps the only rule that serious astrologers have ever agreed on, namely *no chart factor shall be judged in isolation*. Astrologers sensitive to standards in astrological writing might well reject his book out of hand.

Tarnas stresses that "astrology is not concretely predictive but, rather, *archetypally* predictive" (p. 67, his emphasis). (Tarnas does not let on that millions of Eastern astrologers might disagree with him.) Thus a strong Mars does not indicate bullying or aggression but only the "archetypal dynamics" of Mars (energy, assertiveness), whose precise nature can be seen only after the event. Since we all have to be energetic and assertive at various times just to survive, a positive match is guaranteed. Why be disenchanted when you can have nonfalsifiability?

Moreover, as every first-year psychology student knows, positive cases do not necessarily indicate a correspondence. The correlation between John Nelson's astrology-like forecasts of shortwave radio quality and the observed quality was a negligible $r = 0.01$, but by counting positive cases he got an apparent hit rate of 93 percent, which for thirty years led him to promote the wrong conclusion. So we need to know if Tarnas's positive cases can also be found for *control* events and birth charts. If so, we conclude that no correspondence exists unless more rigorous tests show otherwise. But Tarnas does not use controls or even hint at their importance. Such an abuse of elementary reasoning might be forgiven in a newspaper horoscope, but it is inexcusable in a Penguin Viking book by a professor of philosophy.

As it happens, such controls have already been applied in astrology, either inadvertently (as when astrologers unknowingly use the wrong birth chart) or deliberately (in the same way that Ray Hyman famously gave reversed indications in his palmistry readings). The results show that wrong charts match people and events just as well as right charts. Dozens of more rigorous tests where astrologers match birth charts to case histories, or where people try to pick their own chart reading, show when meta-analyzed no evidence to support Tarnas's claims.[2]

In his interview Tarnas says his courses and seminars in archetypal astrology "have been extraordinarily popular with the students and have influenced the rest of their studies in psychology, philosophy, or cosmology," which shows how "astrology represents an intellectually rich and rigorous mode of inquiry" (p. 51). But if his courses are as lax as his book, their popularity is

unsurprising. You need only watch American television to see how easily enchantment trumps critical thinking.

One final distressing feature of Tarnas's book is its hostility to readers. Tarnas seems incapable of writing concisely or vigorously, or of organizing his material coherently. His points drown in torrents of long words that induce mental paralysis and a strong disinclination to read further.

Indeed, there seems to be nothing so concrete that Tarnas cannot render it vague and abstract. For example, Tarnas uses nearly forty chapter headings for his planetary results without ever mentioning which planets are involved, leaving you to struggle with abstractions such as "Awakenings of the Dionysian" and "Great Heights and Shadows." (Are you any the wiser?) The notes for each of his eight parts start from scratch, so there are always up to eight notes with the same number, but no differentiation appears in the notes section other than the part heading, which appears only once and never in the text headers. Since the notes occupy forty-one pages of fine print, don't expect to find a particular note in a hurry. The index is equally frustrating, with, for example, twenty undifferentiated page references to Marx or Jung, and no entry for important items such as his tables of dates of outer-planet aspects. There is no bibliography or list of references, only a list of sources for Tarnas's more than 200 literary quotes ordered by page number.

It needn't be like this. Books such as Dean Simonton's *Psychology, Science, and History* (1990) on quantifying historical events and Frank Sulloway's *Born to Rebel* (1996) on creative lives deal with much the same imponderables as Tarnas does, and with even larger databases. Yet they are highly readable (indeed hard to put down) and filled with effect sizes every inch of the way. If Simonton and Sulloway can do it, we should demand nothing less of Tarnas.

So in the end what can be said about Tarnas's turgid book? According to previews on the jacket, it "shatters our cosmological assumptions . . . awakens us to a living universe . . . is majestic, sweeping and profound." But once the noise is removed the flaws become obvious and the case falls apart. Astrology may still have a place in society as a means of helping therapy by conversation. But unless you see the combination of paralyzing unreadability, inferential incompetence, and unfounded conclusions as a virtue, give this book a miss.

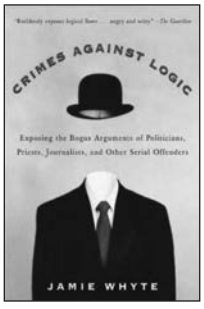
Acknowledgment

My thanks to Ivan Kelly, Arthur Mather, and Rudolf Smit for help in preparing this review.

Notes

1. According to the Institute's Web site (www.ciis.edu), the Institute is an accredited university "that connects the spiritual and practical dimensions of intellectual life." It has about sixty faculty, and about 1,000 students typically aged around thirty, of whom 75 percent are female. Tarnas teaches courses in archetypal studies, astrology and esoteric studies, history of Western thought and culture, philosophy, and depth psychology (approaches based on the unconscious and on Freudian psychoanalysis).

2. Surveys by myself and others of the scientific evidence for and against astrology, plus other critical articles including an expanded version of this review and a review of Willis and Curry, are available at www.astrology-and-science.com, rated by the Astronomical Society of the Pacific's website as "the most useful site for information on testing astrology."


CRIMES AGAINST LOGIC
Exposing the Bogus Arguments of Politicians, Priests, Journalists, and Other Serial Offenders
JAMIE WHYTE

A Lively Guide to Resisting Bogus Reasoning

MARK DURM

Crimes Against Logic: Exposing the Bogus Arguments of Politicians, Priests, Journalists, and Other Serial Offenders. By Jamie Whyte. McGraw-Hill, New York, 2005. ISBN 0-07-144643-5. 157 pp. Softcover, $12.95.

> Not caring about contradiction is the same as not caring about the truth.

The above, in one sentence, summarizes Jamie Whyte's purpose for writing *Crimes Against Logic*. He believes strongly that societies have become careless with the truth, careless about the definition of truth, and care for everything but the truth. Whyte is a former lecturer of philosophy at Cambridge University, and won the *Analysis* journal's prize for best article by a philosopher under thirty. He is the author of numerous articles written primarily on the subject of truth.

He writes in the preface that he sends many letters to the editor of the London *Times* under the pen name "Outraged in London." What is he so outraged about? Errors in reasoning, fallacies, and muddled thinking. He adds:

> The modern world is a noxious environment for those of us bothered by logical error. People may have become no worse at reasoning, but they now have so many more opportunities to show off how bad they are. If anyone cared about our suffering, talk radio and op-ed pages would be censored. Even congress is now broadcast, as if no torment were too great.

Whyte then questions why, with all those errors in reasoning and fallacies of logic and muddled thinking, people don't complain more. His simple answer is "most people don't notice the problem . . . unless you know *how* reasoning can go wrong you can't see that it has." He believes schools and universities teach students invaluable knowledge, but

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leave them incapable of identifying basic errors of logic.

What is the end result of all this? Whyte believes it "makes for a nation of suckers, unable to resist the bogus reasoning of those who want something from them, such as votes or money or devotion."

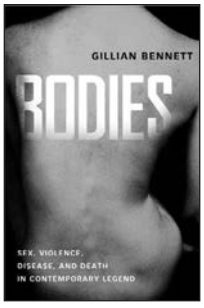
Whyte calls his book a "troubleshooting guide" to reveal the logical contradictions one faces daily. Each of the twelve chapters is devoted to a logical fallacy. Whyte believes if the average person can be shown logical contradictions, then he or she will care more about the truth. The chapters have names such as "The Right to Your Opinion," "Prejudice in Fancy Dress," "Shut Up," "Empty Words," and "Morality Fever."

Whyte doesn't use the usual jargon for logical fallacies, such as *tu quoque, ad hominem*, and *circulus in probando*; he writes for the lay reader. His term for words with positive connotations is *hooray words*; those with negative connotations are *boo words*.

Four of the better chapters are "Inconsistency," "Shocking Statistics," "Equivocation," and "Morality Fever." This last is excellent and relates three reasoning errors that commonly occur when moral fever takes hold. This fever causes one to think that what is unnatural is illegal (it may not be); that what is righteous is true (it may not be); and that all victims of injustice are infallible (they may not be).

At one point in the book Whyte echoes what Sir Francis Bacon wrote 400 years ago: "A man prefers to believe what he prefers to be true." Whyte writes, "It's just that, on some topics, many people are not really interested in believing the truth. They might prefer it if their opinion turns out to be true—that would be the icing on the cake—but truth is not too important."

Jamie Whyte wrote this book to expose bogus arguments of politicians, priests, journalists, and others who play with the truth, to make us care about the truth, and to recognize crimes against logic.



Body of Evidence

BENJAMIN RADFORD

Bodies: Sex, Violence, Disease, and Death in Contemporary Legend. By Gillian Bennett. University Press of Mississippi, Jackson, Mississippi, 2005. ISBN 1-57806-789-8. 313 pp. Hardcover, $45.

Organ Theft Legends. By Veronique Campion-Vincent, translated by Jacqueline Simpson. University Press of Mississippi, Jackson, Mississippi, 2005. ISBN 1-57806-593-3. 236 pp. Hardcover, $45.

Two new books, both from the University Press of Mississippi, tackle the fascinating theme of bodily harm in modern folklore. While Gillian Bennett's *Bodies: Sex, Violence, Disease, and Death in Contemporary Legend* takes a broad look at the issue, Veronique Campion-Vincent's *Organ Theft Legends* focuses on a specific genre.

Gillian Bennett examines folklore and urban legends about bodily contamination, including stories of serpents slithering into sleeping victims' mouths and young brides who unknowingly wear a dead woman's dress. Bennett also tackles Satanic Ritual Abuse rumors, Blood Libel myths used to persecute Jews, and "AIDS Aggressor" stories of those who intentionally infect others with the disease (often with the horrifying—if unlikely—phrase, "Welcome to the world of AIDS!").

The book provides insight into issues beyond folklore. For example, paranormal claimants often suggest that the uniformity of reports (say, of alien abductions, near-death experiences, or Bigfoot sightings) offers proof that the experiences are real. Bennett, however, sees things differently: "There are two ways of interpreting recurring stories and repeated claims. The first is to believe, as Forteans believe of anomalous occurrences, that the multiplicity and similarity of the claims is evidence that such things really happen. The other is the folkloristic approach, which sees recurring story patterns as evidence of the presence of folklore. I unashamedly take the folkloristic position: the more similar the pattern, the more closely I feel one should scrutinize the individual claims."

In the book's most fascinating chapter, Bennett examines stories of organ theft and places the narratives in a cultural context. Stories of body part theft go back centuries (Mary Shelley's *Frankenstein* is a notable example), and simply dismissing such stories as rumor ignores the latent but very real public antipathy toward (and mistrust of) the medical establishment. This theme is strong in the alternative medicine community and in Kevin Trudeau's books (see article and review in the January/

Benjamin Radford wrote about organ theft urban legends in SKEPTICAL INQUIRER, Fortean Times, Pensar, *and* South American Explorer *magazines.*

February 2006 SI). Gillian explains that this distrust has been fueled by many real-life cases of hospitals and medical professionals misusing, selling, or abusing body parts (for example, in 2004, Tulane University officials admitted that seven bodies donated to help advance medicine were sold to the military and blown up in land mine tests).

The lay public and the medical community have very different ideas about the significance of corpses. Doctors and anatomists need bodies to study and take transplants from, but they also need the approval of wary families.

Stories have circulated for decades about innocent children (particularly in Latin America) who are snatched off the street in black cars, only to be butchered and their body parts sold to rich Americans or Europeans. Gillian traces variations of the story to 1852, in which a horse-drawn carriage was said to abduct children from the streets, the blood being used for a diseased king to bathe in as a cure.

While Gillian's discussion of the organ theft urban legend is adequate for most readers, those wishing a more complete and detailed examination will find Veronique Campion-Vincent's book *Organ Theft Legends* an indispensable read. The goal of the book is to explain why the collective belief in organ theft continues despite an utter lack of evidence and repeated denials to the contrary. The process Campion-Vincent describes by which scraps of rumor become believed "fact" applies to many paranormal topics.

Because the organ theft story is one of the most fascinating and complex urban legends, Campion-Vincent's account touches on many issues, including the role of Soviet propaganda in spreading the rumors; the (reputed) involvement of organized crime; the racist elements in legends; rumors being used as social control; and of course both real and imagined organ theft.

Campion-Vincent shows in meticulous detail the media's role in exploiting the urban legend. The book launches a stinging indictment of the sensationalist press (not only in Latin America but in Europe as well) all too eager to recycle and legitimize rumors and disproven claims. Well-intentioned but gullible and agenda-driven non-governmental organization are also blamed for citing rumors as fact, including the World Organization Against Torture. These organizations, Campion-Vincent shows, are so eager to highlight human rights violations that they champion many meritless abuse claimants.

If the book has a fault, it's the (at times repetitive) details of the organ-theft stories and the media accounts that hyped them. Still, it's hard to criticize a book for being scrupulously documented and well-researched. It is the definitive book on the topic, and both books make important contributions to folklore. At $45 each, these books will have limited popular appeal, though folklore scholars will find them indispensable. □

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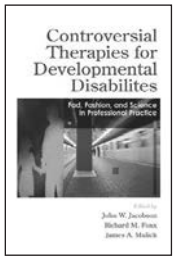
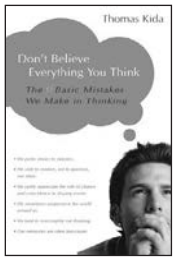
***Chasing Reality: Strife over Realism*. Mario Bunge.** University of Toronto Press, Toronto, Canada. 2006. 342 pp. Hardcover, $75. In his latest book, distinguished philosopher Mario Bunge (McGill University) explores the controversies over the reality of the external world. He offers an extended defense of realism, a critique of various forms of contemporary antirealism, and his own version of realism. He examines the main varieties of antirealism—Berkeley's, Hume's, and Kant's; positivism, phenomenology, and constructivism—and argues that all of these in fact hinder scientific research. Genuine science is objective, in Bunge's view, even when it deals with subjective phenomena such as feelings and fear.

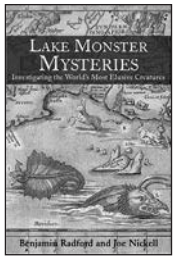


***Controversial Therapies for Developmental Disabilities: Fad, Fashion, and Science in Professional Practice*. Edited by John W. Jacobson, Richard M. Foxx, and James A. Mulick.** Lawrence Erlbaum Associates, Mahwah, New Jersey, 2005. ISBN 0-8058-4192-X. 505 pp. Softcover, $49.95. In the past three decades a large, complex, and costly human services system has evolved in the United States to serve people with mental retardation and developmental disabilities. Much of what has been created has been uninformed by scientific research or evaluative studies. In this detailed and important book the editors and several dozen contributors from a variety of disciplines examine fad, dubious, controversial, pseudoscientific, ineffective, politically correct, and sometimes damaging or depriving treatments. The book is aimed at fellow professionals in the field, in an effort to help distinguish between effective and ineffective interventions and avoid wrong-headed and costly decisions about care.



***Don't Believe Everything You Think: The 6 Basic Mistakes We Make in Thinking*. Thomas Kida.** Prometheus Books, Amherst, New York, 2006. ISBN 1-59102-408-0. 300 pp. Softcover, $19. A simple, readable introduction to how we think and how our thinking can go wrong. Kida (Isenberg School of Management, University of Massachusetts) describes "a six-pack of problems" that leads many of us astray in our thinking: We prefer stories to statistics; we seek to confirm; we don't appreciate the role of chance and coincidence in life; we can misperceive our world; we oversimplify; we misremember. He draws on wide-ranging research and writings and writes in an easygoing, conversational style in an effort to reach a wide audience with his central message that skeptical thinking is a route to clear thinking.

***Darwin Is My Hero: Poems about Science and Superstition*. Craig Gosling.** Craig Gosling, 9129 Sand Key Lane, Indianapolis, IN 46256, 2006. 94 pp. Softcover, $15 +$2 S&H. A collection of simple verse about evolution, workings of the brain, blind faith, hypocrisy, death, fulfillment, natural disasters, mythology, and common sense, all meant to promote skeptical inquiry. The author is an associate professor emeritus in the Indiana University School of Medicine and a lifelong scientific and medical illustrator. Some of the poems are accompanied by Gosling's elegant line drawings.



***Lake Monster Mysteries: Investigating the World's Most Elusive Creatures*. Benjamin Radford and Joe Nickell.** With a Foreword by Loren Coleman. University Press of Kentucky, Lexington, Kentucky. 2006. ISBN 0-8131-2394-1 190 pp. Hardcover, $24.95. Two veteran skeptical investigators associated with CSICOP and the SKEPTICAL INQUIRER here draw upon their own detailed field research and their reviews of hoaxes, claims, and legends about mysterious creatures in lakes. The result is an up-to-date examination from a scientific perspective of widespread mysteries of alleged lake monsters. Specific lakes studied in detail include Loch Ness, Lake Champlain, Lake Memphremagog, Silver Lake, Lake Crescent, Lake George, and Lake Okanagan, plus a variety of others.

***The State of State SCIENCE Standards*. Paul R. Gross, with Ursula Goodenough, Susan Haack, Lawrence S. Lerner, Martha Schwartz, and Richard Schwartz.** Thomas B. Fordham Institute, 1701 K Street NW, Suite 1000, Washington, DC 20006, 2005. 74 pp. Softcover. The first comprehensive review of state science standards (for K–12 science teaching programs) since 2000 provides mixed results. The good news is that nineteen states have put in place standards clear and rigorous enough to earn them an "honors" grade of "A" or "B." More than half of U.S. children attend schools in these states. (The A-rated states are California, Indiana, Massachusetts, New York, New Mexico, South Carolina, and Virginia.) Unfortunately, fifteen states received failing grades, signifying either that they have no real standards for their science programs or that their standards are so vague and weak as to be meaningless. The remaining sixteen states get "C" or "D" marks. The report reviews each state's standards and discusses criteria and methods, grading, results, comparison between 2000 and 2005, and common problems. The state-by-state reviews can be found at www.edexcellence.net.

—Kendrick Frazier

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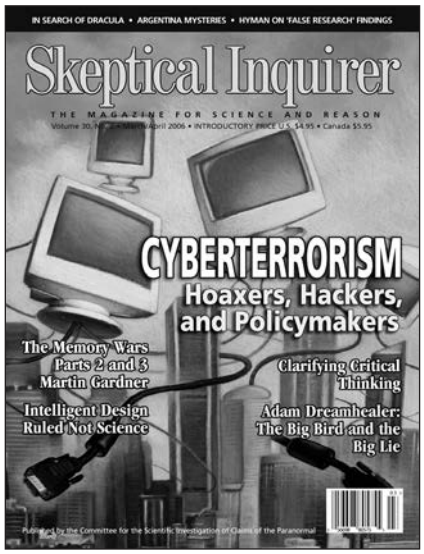
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The Memory Wars Parts 2 and 3 Martin Gardner
Clarifying Critical Thinking
Intelligent Design Ruled Not Science
Adam Dreamhealer: The Big Bird and the Big Lie

Cyberterrorism, Hoaxers, and Policymakers

Carolyn Meinel ("Hoaxers, Hackers, and Policymakers," March/April 2006) is right to conclude that we should be wary of unsubstantiated claims from "self-described computer security researchers," but her article itself makes unsubstantiated claims. She argues that the testimony of "Dr. Mudge" (Pieter Zatko) and fake hacker "Se7en" ("Christian Valor") before federal policymakers about "a looming electronic Pearl Harbor" may have been a cause of two events for which she provides no evidence of a connection.

The first, a possible FBI sting operation, in which Khalid Ibrahim, a member of Indian separatist group Harkat-ul-Ansar, paid $1,000 to "Chameleon" (eEye Digital Security's Chief Hacking Officer, Marc Maiffret), is described fairly accurately in two books which Meinel says "hyped the raid to say that hackers were in league with al Qaeda." Neither Adam Penenberg and Marc Barry's *Spooked: Espionage in Corporate America* (2001, Perseus Books, ch. 9) nor reformed hacker Kevin Mitnick's *The Art of Intrusion* (2005, Wiley, pp. 32–34) is guilty of such hype; both mention the FBI operation theory and the fact that, despite Maiffret's admitting to receiving the payment, he was never indicted. Neither mentions al Qaeda; both correctly say that Khalid Ibrahim was in Harkat-ul-Ansar. There's no evidence that this incident had anything to do with Mudge or Se7en.

The second claim is that the hacker testimony led to a diversion of resources and attention from counterterrorism to cybersecurity on the part of the National Infrastructure Protection Center (NIPC), citing the fact that in 2000, NIPC spent only $4.9 million on counterterrorism, which mostly went for office equipment and training. Meinel concludes that this prevented NIPC from having the resources to follow up on Phoenix FBI Special Agent Ken Williams's memo about al Qaeda members at flight schools, citing a book by Gerald Posner in support of this conclusion.

Posner's book's discussion of the Williams memo (pp. 169–173) does not support Meinel's claim. Posner makes no mention of NIPC and attributes the failure to act on the memo to the failure of FBI middle management to recognize its significance—they considered devoting resources to check out the students at flight schools "too costly and time consuming, and a few even expressed concerns that such a probe might be criticized in Congress as racial profiling."

Meinel's argument unaccountably assumes that NIPC was the agency to follow up on the memo, rather than the FBI's counterterrorism division, even though NIPC's primary focus was cybersecurity and its total annual budget was less than $20 million a year through 2000. It makes far more sense to attribute FBI intelligence failures to its own antiquated IT infrastructure, which had forty-two separate database systems that could not be searched simultaneously. Congress withheld $60 million in funding for the FBI's IT infrastructure between 1998 and 2000, because of the agency's failure to produce a credible upgrade plan. This is because FBI Director Louis Freeh was something of a technophobe, who didn't devote any resources toward developing a plan until he hired Bob Dies to begin work on the issue in July 2000. (See the "Missing Documents" chapter of Ronald Kessler's *The Bureau: The Secret History of the FBI* [2002, St. Martin's Press], the "9/11" chapter of James Bovard's *The Bush Betrayal* [2004, Palgrave Macmillan], and ch. 18 of Meinel's cited source, Gerald Posner's *Why America Slept: The Failure to Prevent 9/11* [2003, Random House]).

Further compounding the intelligence failures was the CIA's "Alec Station" (a group devoted specifically to Osama bin Laden), which failed to supply critical information about September 11, 2001, hijackers to the FBI or the NSA, as documented in James Bamford's *A Pretext for War: 9/11, Iraq, and the Abuse of America's Intelligence Agencies* (2004, Doubleday, esp. ch. 9).

Finally, the idea of a major Internet attack having serious consequences is not a fantasy, as Meinel herself argued in "Code Red for the Web" in the October 2001 issue of *Scientific American*. In that article, she stated that risks are "far worse than not being able to make bids on eBay—potentially affecting product manufacturing and deliveries, bank transactions, telephony and more." She also points out in that article that as time goes on, the risks become greater as we become more dependent upon Internet infrastructure.

Today, there are millions of compromised end-user machines on the Internet, which are regularly accumulated in large numbers into the control of individual entities, making them into "botnets." Botnets are most frequently used as proxies for sending spam messages, but are also often used to launch distributed denial of service attacks. If such attacks were focused on particular pieces of Internet infrastructure, they could easily cause large disruptions for any companies that don't have either huge amounts of bandwidth or have their critical resources deployed in a distributed fashion without sufficient redundancy and protections to withstand large-scale attacks. Most of the attackers making use of these mechanisms today do so with impunity, with criminal prosecutions few and far between. An argument could easily be made that there are not enough resources being devoted to Internet criminal activity, rather than too many.

Jim Lippard
Phoenix, Arizona

Carolyn Meinel responds:

In FY 2000, NIPC diverted over $10 million in congressionally earmarked counterterrorism funds to the hacker beat. Total funding for NIPC that year was $20,665,436 (GAO 2001, 90), and of this, over three quarters was congressionally designated for counterterrorism. Yet as noted in my article, that year, NIPC spent only $4.9 million on counterterrorism. Consequently, according to two of terrorism czar Richard Clarke's staffers, "after September 11, the FBI acknowledged . . . that despite hundreds of millions of dollars of budget increases . . . it had no more agents working on counterterrorism cases than it had in 1996. . . . The Bureau had actually assigned most of these new personnel . . . [to] the FBI's cybersecurity unit" (Benjamin and Simon 2002, 348–349).

This failure included the FBI's overseas counterterrorism operations. On September 20, 2002, Michael E. Rolince, Special Agent in Charge of Counterterrorism, Washington Division of the FBI, testified before a joint hearing of the Senate and House Intelligence Committees that fewer FBI agents in total were assigned to counterterrorism on

September 10, 2001, than had been in August of 1998 (Risen 2002, Section A, 1).

Now for the real story on Khalid Ibrahim. He was never a member of al Qaeda affiliate Harkat-ul-Ansar, a Kashmiri separatist group that existed from 1993 to 1997 (Center for Defense Information, 2002). All media references to Ibrahim's alleged membership stem from him using it as a cover story after May 1998, when contacting hackers as an FBI "narc."

Ibrahim first appears in the historical record in 1992, when he was active with Al Kifah (an alleged CIA front) in its Khost, Afghanistan, office. That was when he hooked up with FBI contractor Ali Mohamed, a naturalized U.S. citizen from Egypt, who earlier had been a U.S. Army sergeant assigned to a Special Forces unit at Fort Bragg, North Carolina. In 1992, Mohamed and Ibrahim transferred together to the Al Kifah center in Brooklyn, New York, under a CIA visa program (Weiser 1998, Section A, 1). Apparently, Ibrahim worked closely with the FBI in tracking al Qaeda. Most famously, on July 13, 1995, U.S. Attorney Patrick Fitzgerald questioned Ibrahim as part of the Terrstop investigation: "Are you familiar with the person by the name Osam Ben Laden, O-s-a-m B-e-n L-a-d-e-n?" Ibrahim replied, "Yes" (Benjamin and Simon 2002, 234–235).

This was the first public indication that bin Laden was finally on the radar screen of the FBI. The fact that the FBI diverted Ibrahim to the hacker beat may have been a consequence of priorities warped by Dr. Mudge's and Se7en's phony training sessions for FBI managers. This, despite Mohamed's 1997 warning to the FBI that al Qaeda "had planted hundreds of terrorists, known as 'sleepers' or 'submarines,' who would lie low for years until they were activated" (Miller 2001; Weiser 1998).

There is a gigantic difference between what I wrote about war in cyberspace in *Scientific American* and Dr. Mudge saying he could shut it down single-handedly and Richard Clarke's allegation that this sort of Internet crash could cripple the military and kill lots of people.

I agree that we should further secure cyberspace. However, too many places on our planet have corrupt, failed, or hostile governments for us to rely on law enforcement. We need to increase basic computer-science research, instead of cutting it in favor of increased law enforcement, as the Bush administration has done. Currently, private initiatives are carrying most of the load. See, for example, the Adaptive and Resilient Computing Security Workshops (www.arcs-workshop.org/), financed by the MacArthur Foundation and Santa Fe Institute, in which I have had the pleasure of participating.

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Carolyn Meinel's excellent article, "Hoaxers, Hackers, and Policymakers," was of particular interest to me, since I've worked on a number of risk-assessment and due-diligence efforts for both DOD agencies and Fortune 500 companies. In fact, I saw it on the newsstand at Borders, bought it, and read it on the spot. I'd concur with a couple of important lessons learned that she points out. First, policymakers don't take a systems-analysis approach to risk assessment; instead, they treat each risk in isolation, leading them often to overestimate external risks and underestimate internal ones, especially the omnipresent internal risk of management infighting and bureaucratic inertia. Second, policymaking due-diligence has been degraded by the mass media's superficial approach to all science and technology issues; the mass media report science and tech stories at a sensational pitch, often incorrectly, with a very short shelf life.

There is hope: Internet experts' efforts at due diligence, through blogs or online highly focused research projects, to fact-check mass media misreporting are emerging tools to vet these inaccurate stories, as are articles like Meinel's in your publication.

Christine Brim
President, Envoy Group LLC
Fairfax, Virginia

I agree with Ms. Meinel insofar as that an electronic Pearl Harbor is overhyped (much like Y2K was) and quite unlikely. However, I found her speculation about the effect of the cyberterrorism hoax on September 11, 2001, speculative at best. She forcefully asserts that it did have an effect with the sentence, "Therefore, the FBI lacked the resources to follow up on an agent's warning of al Qaeda members at U.S. flight schools."

We could create a lot of "what ifs" about September 11, 2001 (and far too many people do), but in reality, the $4.9 million for the NPIC is hardly that much of the FBI's considerable budget. It may be true that money to fight cyber threats and terrorism came from the same pot, as she puts it, but this is hardly the only pot of money at the FBI for counterterrorism.

If it was the only source of money for counterterrorism and was spent on just cyberterrorism, then there would have been much more to be concerned about with the NPIC. With as much validity, we could create "what ifs" about cyber attacks that never happened because of the training agents got from NPIC. With 911 call centers having been disrupted by computer attacks in the past, there is certainly the possibility of loss of life from cyber threats.

Furthermore, while an electronic Pearl Harbor is unlikely, significant disruptions of the Internet could occur in a couple of ways. The top-level domain servers represent a small set of computers, whose failure would have serious consequences. Additionally, a Cisco IOS-based worm has great potential for large-scale disruption of network service. But rather than focus on just worldwide disruption of the Internet, we should notice that worms and other attacks have had effects on critical infrastructure on a local scale. Just from nondirected attacks, airlines have been shutdown for hours, 911 call centers have been severely disrupted, and respectable security researchers have argued that the August 14, 2003, blackout was at least partially caused by the Blaster worm.

Electronic Pearl Harbor or not, a critical infrastructure that has suffered local failures from nondirected attacks is certainly even more vulnerable to directed attacks. These threats are serious, and we should be careful not to underestimate them as well as overhype them.

Perhaps, the way to avoid such overhype is to stop using FUD (fear, uncertainty, and doubt) to sell security products, but to instead use well-balanced risk analysis to make cases for action. FUD is easier to sell,

but eventually, you sound like the boy that cried wolf.

Adam Slagell
Security Researcher
University of Illinois at
Urbana–Champaign

Critical Thinking

Congratulations and thanks to Howard Gabennesch for a great piece on critical thinking ("Critical Thinking: What Is It Good For? In Fact, What Is It?" March/April 2006). One issue, however, must be made more explicit. In distinguishing between skills, worldview, and values as the pillars of critical thinking, we must acknowledge that the last two usually rest more on emotional than intellectual foundations. This is at the root of our endless capacity to continue deceiving ourselves, even when confronted with facts that run contrary to our beliefs.

Against this unfortunate aspect of human nature, the skeptical movement typically offers an ineffectual remedy: more, better, and different truths and facts for appreciation by the intellect, the very function that proves largely impotent in combating irrational belief. A more effective path could be found in the recognition that for most people, the passions drive behavior more than the mind. For example, some creationists could be demonstrably smarter than many evolution supporters on the basis of IQ tests. The problem, however, is that their emotional attachment to their beliefs makes them place their otherwise strong intellects in the service of an underdeveloped emotional function.

Our skepticism will remain shallow and ineffectual if it fails to acknowledge the roots of human behavior. While we must strive for more scientific and rational explanations, we must also understand that emotional development may well prove a more effective path to reducing people's resistance to the truths of science and reason than the continual refinement of intellectual arguments.

Pantazis Mouroulis
Glendora, California

I found myself agreeing with many, but not all, of Howard Gabennesch's conclusions. For example, I agree that the definition of critical thinking is in need of further refinement and that some textbooks perpetuate misconceptions and uncritical views. However, I disagree with three of his main points. First, I disagree with his generalization about the poor state of critical thinking in the social sciences. Second, I think his pessimistic interpretation of the widespread endorsement of critical thinking is unfounded. Finally, I have problems with his definition of critical thinking.

I think that efforts to foster critical thinking in at least one social science, psychology, are beginning to show some success. Last October, I attended a national conference on critical thinking in psychology in Atlanta. This conference was attended by many critical-thinking experts and over 200 psychology teachers eager to more clearly define critical thinking and to improve their teaching of it. Also, some psychology textbooks seem to do a fairly good job of teaching critical thinking. In the case of my own critical-thinking textbook, our research has found that students in classes using the textbook have performed significantly better on a variety of critical-thinking tasks than students from comparable classes not using the textbook. Gabennesch is right to question the impact that critical-thinking instruction in the social sciences is having on people's everyday thinking, but I believe psychology is on the right track.

Moreover, the widespread endorsement of critical thinking as an educational objective in psychology is a good thing, not a danger. Even if many teachers have somewhat different definitions of critical thinking, I have found that many recognize it as closely related to good reasoning, problem solving, and decision making, which it is. Their high levels of endorsement should motivate them to more clearly define it.

There are also signs that the lack of definition of critical thinking may be abating in at least some circles. The American Philosophical Association approved a consensus definition of critical thinking containing language that is mostly consistent with the language that I, a psychologist, use to define critical thinking. Nowhere in their definition do they use the word *truth*, which Gabennesch uses in his definition, when he says that critical thinking involves getting "as close as possible to the truth." If by this, he means reaching a state that corresponds to some objectively real standard, then many pragmatic philosophers of science and skeptics who define truth as "what works" would object to his definition. In fact, his use of *truth* seems at odds with his own emphasis on critical thinkers as being suspicious of certainties.

Despite our disagreements about how to define critical thinking, I think our many agreements should allow us both to productively work toward the improvement of critical thinking. Nevertheless, we should persist in trying to precisely define critical thinking, especially when we try to teach and assess it. We will only know if our efforts to teach it have been successful if we scientifically assess the outcomes of this instruction. Finally, by developing precise operational definitions of critical thinking for instruction and assessment, we can further refine our scientific understanding of this important concept.

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Memory Wars

Martin Gardner ("The Memory Wars, Parts 2 and 3," March/April 2006) describes only one of a still growing and not-so-small number of cases in which a member of the Roman Catholic clergy is accused on the basis of long-repressed and recently recovered memories of childhood sexual abuses allegedly having occurred decades ago.

After clergy abuse cases where the accusers have reliable memories, which, in many cases, can be corroborated, others come forward to claim that their repressed memories were "triggered" into consciousness by the publicity of these earlier cases. Quite a few of the latter, dubious memory cases have also resulted in large financial compensations, because the greater cost of contesting each of these cases in the courts had become financially prohibitive.

When the Spokane diocese offered to settle seventy-five cases for $45.7 million last year, the number of claimants jumped to 176, and the diocese filed for bankruptcy. The claimants in most of those latter cases maintained that they had recovered hitherto repressed memories. Still, they may be awarded damages (according to the Associated Press, March 14, 2006).

Legal opinion in the matter of repressed/recovered memory is often at odds with the scientific evidence, and judges may fall for the argument put forward by expert witnesses for the prosecution that eighty-three or so scientific studies support the notion. (In psychological jargon, repression of traumatic memories is called *dissociative amnesia*.) To date, only six judges have ruled on the admissibility of recovered-memory testimony, with two accepting the testimony and four rejecting it.

CSICOP fellow and memory researcher Elizabeth Loftus, together with psychiatrist Harrison Pope, a Harvard expert on research design, last November convinced Omaha, Nebraska, District Judge Sandra L. Dougherty that these studies fail to establish that "repressed and recovered memory is reliable and admissible as scientific evidence in the courts" (District Court of Douglas County, Nebraska, *Rivers v. Father Flannagan's Boys Home*, Doc. 1024, No. 743).

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London, Ontario
Canada

Big Bird, Big Lie

Ms. Neimark ("The Big Bird, the Big Lie, God, and Science," March/April 2006) appears to be a credulous believer rather than a skeptic. Her overriding theme was that the evidence was equivocal with regard to distant healing. Baloney. Only the poorly designed studies have lent equivocal results. Ms. Neimark and others make the *a priori* assumption that there is actually an effect of prayer; this is not a good, scientific approach.

These studies are not hard to design. For example, take a random sample of 1,000 lung-cancer patients, all in the same stage of sickness, and randomly divide them into two groups. Statistically compare the groups with respect to a metric (e.g., rate of remission). Then, have several large-congregation churches pray for one group (the treatment group). The other (control) group would receive no additional prayer. None of the patients would know they were involved in the experiment. Afterwards, again compare the metric between the two groups.

Even with all of the evidence she provided showing the dishonesty of Adam, not to mention his ludicrous statement that a bird had telepathically downloaded all of the information of the universe into his brain, she still holds out hope (see her final paragraph) that he is a real distant healer. Please! Just tell me how a chemical reaction in your brain (a thought) can possibly affect someone's health in a distant location?

Anthony Robinson
Research Branch
Arizona Game and Fish Department
Phoenix, Arizona

"The Big Bird, the Big Lie, God, and Science" reminded me of my favorite Edgar Mitchell story. In his autobiography, *The Way of the Explorer*, Mitchell recalls a lunch with Uri Geller at the SRI cafeteria. Mitchell asked Geller to use his special powers to retrieve a Hasselblad camera Mitchell had left on the moon after completing his final moon walk. The serial number of that camera was on record with NASA, and so Mitchell knew it would prove Geller's powers to even the most hardcore skeptic. No sooner had Geller agreed to try than he cut his lip on a sharp piece of metal while eating ice cream. Miracle of miracles! Edgar Mitchell's long-lost tie tack had miraculously materialized in Geller's mouth!

No, it wasn't the Hasselblad, but since Geller was able to bring back the lost tie tack, Mitchell was hopeful that the camera would soon follow. This story gave me the creeps. No one considered the results if Geller had been successful and that big, old Hasselblad had materialized in his mouth. If that had happened, I imagine Geller's head would have exploded like a Halloween pumpkin packed with an M-80, and they would have been wiping what was left of his brains off the ceiling! What a mess that would have been. And can you imagine the obituary: "Famed spoon bender dies in successful demonstration of telekinesis"? No, thank you!

Gordon Reade
Palo Alto, California

Evolutionary Psychology

I was dumfounded to read the following statement in the closing paragraph of Massimo Pigliucci's column, "Is Evolutionary Psychology a Pseudoscience?" in your March/April 2006 issue: "While all this doesn't make evolutionary psychology a typical example of pseudoscience, say like astrology or parapsychology, it certainly moves it away from mainstream evolutionary biology and into a territory uncomfortably close to pure historical research, where reasonable scenaria [*sic*] are the best one can hope for and hard data are difficult to come by or interpret."

This is dangerously close to the misguided mantra of creationists, who claim, "If you were not there, you cannot prove it." To them, historical science doesn't exist, only experimental science. Is this really what Pigliucci meant to imply? If so, like creationists, he would be dismissing many sciences, or parts of them, including cosmology, geology, paleontology, biogeography, ecology, systematic and evolutionary biology, etc. True, experiments help add more strength to scientific hypotheses, but in many of these sciences, the repeatability and corroboration of observations of the past represent some of the strongest science. (We still don't have any Devonian horses.)

As I know little about evolutionary psychology, I have not formed an opinion, but I do think we need to know why Pigliucci seems to be impugning much of science. If I misunderstood his position, please explain.

David Archibald
Professor of Biology
San Diego State University
San Diego, California

In his column, "Is Evolutionary Psychology a Pseudoscience?," Massimo Pigliucci says: ". . . behaviors have an annoying tendency not to leave a fossil record, and neither do the details of the (largely social and cultural) environment under which natural selection allegedly operated throughout recent human evolution." I believe this is an unduly pessimistic view. There are a huge number of archaeological and fossil artifacts in the form of cultural objects, ancient writings, buildings, graves, and ornaments/carvings/inscriptions that originated in religious/superstitious beliefs. A study of these shows a remarkable parallelism between cultural/psychological/spiritual evolution in different parts of the world and provides support for and new insights into previous speculative relationships. These include such things as early human migration, connections between ancient religions/superstitions in widely separated communities, common aspects of building design, cultural symbolism, and others. There may even be a bearing on the modern history of Islamic politics, practice, and influence.

In the light of this information, one must surely accept that the study of evolutionary psychology is perfectly reasonable and part of science in its broadest sense.

George F. Wood
Cheltenham
England

Massimo Pigliucci responds:

I wish to reassure Prof. Archibald that my criticism of evolutionary psychology is not to be interpreted as a general dismissal of historical sciences. As an evolutionary biologist, I am a (partially) historical scientist myself, and I certainly do not want to commit intellectual

suicide. Moreover, I have actually defended the value of historical scientific research in these pages (see "Are the Historical Sciences Sciences?," July/August 2005).

What I meant, both in my recent column and in other writings on evolutionary psychology (e.g., see chapter 7 of my forthcoming book, cowritten with philosopher Jonathan Kaplan, *Making Sense of Evolution*, Chicago University Press) is that evolutionary psychology is in a particularly bad situation as a historical science when one considers the idiosyncrasies of the human species as a subject of empirical investigation. It is the unfortunate combination of scarce information on relevant ancestral environments, the sparse and relatively uninformative fossil record, and the logistical and ethical problems with human experimentation that makes for a perfect epistemic storm that severely limits evolutionary psychology to a set of interesting, but usually untestable, speculations.

As for the comments by George Wood, I certainly agree that the archaeological record is both rich and informative, but it has little to do with evolution. Evolutionary psychologists claim that "human nature" was shaped during the Pleistocene, well outside of any reliable archaeological record. The problem is with the epistemic laimitations of human paleontology, not archaeology.

Don't *Blink*?

If the SKEPTICAL INQUIRER prints a negative book review (see "The Power of Not Thinking Is Not Very Great," March/April 2006), I'm not likely to read the book. Fortunately, I had already read Malcom Gladwell's *Blink*, and so I won't miss out.

As a skeptic, I understand easily the criticisms that Cecil (the reviewer) lobs at Gladwell, and can see no obvious technical faults in his review. But frankly, I don't think it matters, because he so completely misses the point. Let's just say the book was overanalyzed—something that many skeptics, myself included, are wont to do.

The most important thing, after having read the review, is to disabuse yourself of the notion that *Blink* is somehow antiscience. I didn't get that impression at all. In fact, it's only by virtue of science (and a concomitant skeptical approach at that) that what Gladwell says makes any sense at all. Consider the opening anecdote about the few experts who just somehow "knew" in an instant that the Greek statue they were looking at was fake. Fine. But what about the other experts who also somehow just "knew" in an instant that the Greek statue was not fake? Well, that's why we use science. It's science, not intuition, that determines if the statue is fake or legit. Gladwell knows that, and so do we. It's not until months later, maybe years (in the case of the statue) that we can say whose snap judgment turned out to be right and whose turned out to be wrong. But even that's not very interesting. I mean, suppose I make a snap judgment about who's going to win the next presidential election and, lo and behold, I turn out to be right!

Big deal? No.

But what is a big deal (and what I found to be fascinating reading) is the discovery that some aspects of our cognition, aspects of our otherwise touchy-feely intuitions, are subject to scientific scrutiny.

Be warned, however, that *Blink* is no science treatise. Gladwell uses stories to make his points. He tells anecdotes. Fortunately he does it very well.

Recently, I recommended *Blink* to a friend and was surprised to hear me saying, "It's one of those books that makes you look at the world in a different way." But you know, it does.

Steve Isaacson
Seattle, Washington

First of all, I must say I love your publication and appreciate the work you do on all fronts.

Second, I would like to comment on Wesley Cecil's review of *Blink*, by Malcolm Gladwell.

Cecil seems to have been irritated by the book early on and never got past that feeling. And I think he missed the point of the book in the process. The point of the book as I read it seemed to be that you shouldn't ignore your instincts just because someone claims they already have all the answers.

Cecil accuses *Blink* of being anecdotal in form with a cumulative message that scientific analysis does not work very well. I didn't notice that the book is touted as being a scientific treatise on anything, nor is it antiscience. So what is wrong with a book being anecdotal in nature? Gladwell never suggested that scientific analysis does not work very well. He simply put forward the idea that we shouldn't assume someone has all the answers just because they wear a white lab coat. He stresses that we shouldn't ignore our first instinct just because someone with the aura of authority says something to the contrary. He doesn't say we should ignore the authority figure and he doesn't say we should trust our gut feelings. He simply says we shouldn't dismiss them out of hand.

When I read the book, I felt it fit in the guidelines of skepticism very well and was surprised to find such a scathing review in your pages. I think Cecil missed the point.

Jeff Greif
Elmira, Oregon

I couldn't agree more with Wesley Cecil's evaluation of Malcolm Gladwell's book, *Blink*, and I was very glad to see the review published in the SKEPTICAL INQUIRER. Although Gladwell is to be commended for both the excellent scientific backing and the imagination he showed in his first book, *The Tipping Point*, which greatly supported his thesis that social trends (such as clothing, music, products, etc.) closely follow the patterns of social diseases (a few very active carriers or trendsetters cause both to spike at a certain point where they reach critical mass), *Blink* was not as well thought out.

I especially agree that this book doesn't quite fall into pseudoscience as much as "incomplete" science. At times, Gladwell seemed to even contradict his thesis, and didn't offer the testing, or the interviews with those who could falsify or test this theory, that would make such a test adhere to the scientific method more, and thus offer something to the field of neuroscience or other fields that study human thought processes.

Thanks for the review.

Robert Miller
Irvine, California

Natural Childbirth

My main problem with the answer on natural childbirth in the SKEPTICAL INQUIRER (March/April 2006) is that in his zeal to debunk the New Age adoration of "natural" (a noble effort of which I thoroughly approve), Benjamin Radford has not been fair to natural childbirth. Natural childbirth isn't some New Age hype and is not "antiscience" but is a very mainstream medical practice. Virtually every pregnant woman regularly seeing an obstetrician is requested to attend the birthing classes provided by the hospital. These classes provide training in the techniques of "natural childbirth." These techniques are simply ways to increase physical comfort and reduce anxiety during birth, which, in

turn, keeps the perception of pain to a minimum. They are some of the same techniques used in cognitive behavioral therapy for anxiety. It's just common sense to desire the minimum in medical interventions that come with a price.

The quotes of Shelly Gerard unfairly give the impression that most people who are proponents of natural childbirth are as extreme as her. The reality is that the techniques of natural childbirth are incorporated in current medical practice along with pain medication and epidurals in order to provide the best outcome for mother and baby. It is not "all or none."

The author unfairly lumps the unusual practice of "water birthing" with the traditional methods of natural childbirth, and artificially creates yet another reason to deride it. Water birthing should be treated as a separate issue.

Finally, if given a choice, just about every woman I know would love to go through labor and delivery pain free, as long as there was minimal danger to her or her baby. But that's not the choice they get to make, unfortunately. So, Mr. Radford, please don't hold up to ridicule these very useful tools that help women negotiate the difficulties of childbirth.

Rosalyn Upson
Eugene, Oregon

You were asked what's behind the *current* natural-childbirth movement, which is described as *antiscience*. The use of both terms can and should be disputed.

There is nothing new about natural childbirth, which I would define as childbirth without *unnecessary* medical intervention. Grantly Dick-Read's *Childbirth Without Fear*, published in the late forties, makes a powerful case for nonintervention. His explanation of the sensation of pain during the birth process is lucid and convincing.

The "antiscience" label is equally unjustified. As with so many endeavors, simply because we can doesn't imply that we ought to. I submit that the current obstetrical emphasis on electronic fetal monitors, induction, medication, and the frequency of C-sections is no more than a response to the rise in medical malpractice suits. In this litigious climate, practitioners feel obligated to take all measures in their power to avoid a potential lawsuit. No evidence exists that fetal monitors improve fetal health or well-being. Additionally, C-sections are often performed for no better reason than the convenience of either doctor or patient.

Is childbirth risky? Only in that there are rare but occasional complications. Is a C-section risky? Consider that this is major abdominal surgery requiring anesthesia and weeks of recovery, whereas a woman who has given birth vaginally is typically on her feet immediately. Further, common sense would suggest that the onset of labor occurs when the fetus is ready to be born. Induction or premature removal of the infant from the uterus may not be deleterious but can hardly be beneficial. Granted, in rare instances, a C-section is indicated, e.g., when the baby is simply too big to pass through the birth canal.

Picture it: a laboring woman is typically kept in a prone position, reducing circulation and oxygen both to herself and her fetus and sometimes resulting in cord compression; an IV needle is taped to her hand, which suggests pathology rather than a simple biological process; attendants are more interested in reading the fetal monitor strapped to her abdomen than to communicating with the laboring mother herself; pitocin may be administered by a nervous or impatient doctor. She has been shaven and given an enema. When fully dilated, she is wheeled to the delivery room, where her wrists are strapped to the table. Her doctor may offer, or even insist on, an analgesic that will enter the infant's bloodstream—whether or not the mother appears to be in any discomfort. He will perform an episiotomy that will likely be more painful and take longer to heal than any tearing that might normally occur. These procedures are humiliating, counterproductive, marginalize the mother, and are anything but "natural."

My first child was born at home in order to avoid medical interference; my other three were delivered in hospitals entirely naturally (and pain-free), back in the days when one had to literally fight for and demand such a hands-off process. Twenty-five years later, I doubt that much has changed. The medical community is overly eager to act as managers rather than assistants in the birth process.

Please indulge me in one final observation: fear is the stimulus, pain is the response. We are culturally conditioned to expect and fear pain as a part of childbirth—and it becomes a self-fulfilling prophecy. Yes, there may (or may not) be a few moments of discomfort during transition, but a woman who appreciates that this moment is brief and temporary can get through it with a grin-and-bear-it approach, sort of like having a tooth drilled.

Childbirth is a peak—almost an orgasmic—experience. I only wish that more women could be protected from the myths and old wives' tales surrounding it and open themselves to the pure joy of the moment.

Peggy Gannon
Palmyra, Maine

I read with interest your response to the question regarding "natural childbirth." The letter itself was "loaded" with its assumption that the move toward "natural childbirth" is "anti-science." Most people in the so-called "movement" are simply responding to what they see as the pathologizing of the natural process of childbirth. The amount of technology—and expense—that has been brought to bear on childbirth in our country is obscene. This is especially true, considering the fact that, as reported by The National Center for Health Statistics, among many other reviews (www.cdc.gov/nchs/pressroom/98news/midwife.htm):

> After controlling for a wide variety of social and medical risk factors, the risk of experiencing an infant death was 19 percent lower for births attended by certified nurse midwives than for births attended by physicians. The risk of neonatal mortality (an infant death occurring in the first twenty-eight days of life) was 33 percent lower, and the risk of delivering a low-birth-weight infant was 31 percent lower. Mean birth weight was 37 grams heavier for births attended by a certified nurse midwife than for those attended by physicians. Low birth weight is a major predictor of infant mortality, subsequent disease, and developmental disabilities.
>
> Certified nurse midwives attended a greater proportion of women who are at higher risk for poor birth outcome: African Americans, American Indians, teenagers, unmarried women, and those with less than a high-school education. Physicians attended a slightly higher proportion of births with medical complications. However, birth outcomes for certified nurse midwives were better even after sociodemographic and medical risk factors were controlled for in statistical analyses.

I agree that critical inquiry is necessary, and that everything that is called "natural" is certainly not necessarily "good, safe, or healthy," but I do believe you fell short in your response to this question.

Frank Jude Boccio
judekaruna@aol.com

Benjamin Radford responds:

Natural childbirth *clearly means different things to different people. While Upson derides*

my examples of Shelly Girard (as "extreme") and water birthing (as "unusual"), both are part of the natural birth canon. Overall I agree with the readers' views on the pathologizing of birth, and as I wrote, "Modern medicine is not necessary for a safe, normal birth." The question I focused on was whether "women have good reason to fear doctors and hospitals during childbirth," and I think the readers agree with me that the answer is no.

Chilling in Kansas

The reaction of some Christian fundamentalists to University of Kansas professor Paul Mirecki's criticism of intelligent design (News & Comment, May/June 2006) is chillingly reminiscent of the Muslim furor over the publication of cartoons lampooning the prophet Muhammad in a Danish newspaper. Like their Muslim counterparts, some fundamentalist zealots in this country will do anything to silence their critics up to and including employing physical violence as demonstrated by Mirecki being roughed up by thugs in a pickup truck.

Not only should the local sheriff's office be investigating this, but the FBI should as well—as a possible hate crime.

Jerome N. Cragle Jr.
Mifflinville, Pennsylvania

Ivory-billed Woodpecker

I am disappointed in the line of reasoning taken by Benjamin Radford in his News and Comment piece concerning the recent discovery of an extant population of the ivory-billed woodpecker, a species once thought extinct. He uses the failure of ornithologists to find any evidence of a Bigfoot as an argument for Bigfoot's nonexistence. I, too, consider Bigfoot to be a myth. However, negative evidence, the fact that searchers for the bird did not report any evidence of Bigfoot, doesn't constitute scientific evidence that Bigfoot is nonexistent.

It's a weak argument and not scientific, conservative use of data. The woodpecker searchers didn't report detection of any fish, aircraft, viruses, or gamma rays either, but that fact doesn't argue for those phenomena being mythical.

Although it's a more minor criticism, the cutline for the "digital image" of the woodpecker implies that it's a digital photograph of the bird, when, in fact, the image is of a painting by the late George Miksch Sutton, the namesake of the avian research center for which I work. What is more "digital" about the image of that painting than any of the other illustrations in the publication? And Sutton was not credited for the image. Last, the image was rotated 90 degrees. Ivory-billed woodpeckers are reported to nest in cavities on the vertical trunks of trees, not on horizontal branches, as might be inferred from the misprinted image.

M. Alan Jenkins
Bartlesville, Oklahoma

I enjoyed Benjamin Radford's acknowledgment of the rediscovery of the ivory-billed woodpecker. The generally accepted reason for this woodpecker's previous "extinction" was habitat loss of virgin bottomland forest. However, after studying the illustration accompanying the article, it became obvious that a woodpecker, which builds its nest in a fallen tree trunk, rather than a standing tree, would be subject to repeated failure due to easy predation and drowning of the nestlings at every heavy rain.

Or perhaps the picture is rotated 90 degrees.

Peter C. Weber
Olney, Illinois

Benjamin Radford responds:

Jenkins and Weber are correct that the image was erroneously rotated 90 degrees. Jenkins is also correct that just because the searchers did not report any evidence of Bigfoot doesn't mean that Bigfoot do not exist. That is indeed a weak argument and counter-scientific—as well as a claim I never made. In fact, I quite specifically stated that further research may yet find Bigfoot.

In Search of Dracula

I would like to thank Massimo Polidoro for his valuable column ("In Search of Dracula," March/April 2006), documenting the continued incidence of vampire hunts in Romania. I do, however, take exception to two aspects of his piece. Most egregiously, Polidoro relies too heavily on the venerable work of Florescu and McNally, which posits a link between Vlad Dracula's atrocities and Bram Stoker's creation. Elizabeth Miller and other contemporary scholars have shown convincingly that Stoker's knowledge of the historical Dracula was only slight, drawn almost exclusively from small mentions in Victorian travel literature, and probably did not include the gruesome details of Vlad's mayhem. McNally himself readily acknowledged that the connection between Vlad and Stoker's novel was, at best, ephemeral.

Also, Polidoro would have done well to stipulate that these practices are far from uniquely Romanian. Vampire hunts have been ubiquitous throughout Eastern and Southeastern Europe, indeed throughout the world, and the scenes he describes in Romania would not have been out of place in Victorian New England. A cursory review of the recent work of folklorist Michael Bell and SKEPTICAL INQUIRER contributor Paul Barber would have made this article much better.

Stu Burns
Erie, Pennsylvania

Questions for ID

The following comments on the ID question essentially reinforce those made by Kenneth Morgareidge (Letters, March/April 2006). ID advocates have essentially postulated a fifth force, additional to the four already known to physics, for the action of will on matter. Whether the designer operates by abolishing existing structures and reassembling their atoms into other structures or by acting more subtly on the DNA itself with a snip here and a splice there, this force necessarily breaks and makes covalent chemical bonds in a highly controlled, directed manner—an ability that any chemist (such as myself) would be envy.

Let us, therefore, hear more about the fifth force from the advocates of ID.

Could it also be generated by physical means? Does it act only on biological material *in vivo*, or *in vitro* also? Can it act on inorganic material too, and if not, why not? Does the force obey the inverse-square law? The electromagnetic force is mediated by the exchange of virtual photons; what corresponding statement can we make about the fifth force? These are all scientific questions and worthy of answers. If the ID people are not simply postulating miracles of the biblical type, they must put forward for scrutiny a research program utilizing the methods of science and incorporating the possibility of falsification of their postulates.

Timothy Weakley
Dundee
U.K.

Reader Joseph Fusco (Letters, March/April 2006) asked how we can support a science-based dialogue with creationists, given that they are already out-converting us a thousand to one. As a skeptic and a former Mormon missionary, I can tell you how the Mormons get converts. Their leadership engaged in scientific research on the process of conversion to Mormonism. They honed their approach, discarded unproductive methods, and expanded on what was shown in their research to work.

We skeptics have naïvely assumed that simply being right is enough to make converts. We need to do our own research on what type of exposure it takes to sow seeds of doubt in people's heads and bring them to fruition. I know for a fact that there are plenty of Christians out there who have simply never been exposed to any serious argument from a skeptic about their religion.

Perfectly plausible naturalistic explanations exist for such events as the miracle of the loaves and fishes—for example, a wealthy supporter of Jesus might have provided food anonymously and a rumor got started among gullible listeners that the food had appeared miraculously. Most Christians have never heard of such a possibility. I would love to see a study done of providing such alternative explanations in various ways to young Christians and seeing the effect on their faith later. Not all would be converted to a skeptical attitude; but some would, and we could build on the most effective approaches.

The present religious climate, in which fanatics feel free to criticize atheists and skeptics, is actually a great opportunity for us. We no longer have to be so tentative about challenging absurd religious views out of respect for religious freedom and fear of offending people. They are the ones who started this dialogue; we can be the ones to win it.

Paula L. Craig
Falls Church, Virginia

In commenting on the ambivalence of the word *theory* as it applies in science and in common usage, reader Dave Gardner (March/April 2006) suggests that we also need to start prefacing intelligent design with something to indicate its lack of any relevant scientific status.

I would propose using the word *conjecture*, a formal term used in mathematics, defined as "inference from defective or presumptive evidence" or "conclusion deduced by surmise or guesswork." While describing ID pretty close to what it is, this term does give it some dignity, which is vital for constructive discourse.

Don Keith
Waterloo, Ontario
Canada

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